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DEPARTMENT OF MINES.

MEMOIRS OF THE GEOLOGICAL SURVEY OF NEW SOUTH WALES.

C. S. WILKINSON, F.G.S., &c., GEOLOGICAL SURVEYOR-IN-CHARGE.

PALÆONTOLOGY, NO. 2.

R. ETHERIDGE, JNR., PALÆONTOLOGIST.

CONTRIBUTIONS
TO THE
TERTIARY FLORA OF AUSTRALIA.

BY

DR. CONSTANTIN, BARON VON ETTINGSHAUSEN
(Corr. Member Imp. Acad. Sciences, Vienna),
Professor of Botany, University of Graz, Austria.

ISSUED BY DIRECTION OF THE HON. FRANCIS ABIGAIL, M.P., MINISTER FOR MINES.

SYDNEY: CHARLES POTTER, GOVERNMENT PRINTER.

1888.

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Department of Mines,
Geological Survey Branch,
1st October, 1888.

SIR,

I have the honor to submit Memoir No. 2 of the *Palæontological Series* of the Geological Survey of New South Wales, on *The Tertiary Flora of Australia*, by Dr. C. Baron von Ettingshausen, who kindly undertook the examination of our collections of Tertiary Plants.

The results of the Baron's researches were originally written in German and communicated to the Imperial Academy of Sciences of Vienna; but at my request permission was given for their translation into English and republication here. The accompanying illustrations have the merit of having been printed from the original litho-plates. The work has been edited by Mr. R. Etheridge, jnr., Palæontologist.

The fossils described in Part I of this Memoir were collected by Mr. J. K. Hume, from the Tertiary sandstones at Dalton, and those referred to in Part II were obtained by Mr. T. W. E. David, B.A., F.G.S., Geological Surveyor, and myself, from the Tin-bearing Deep Lead deposits in the Vegetable Creek and Elsmore districts. These deposits, consisting of ferruginous clays, sands, and gravels, vary from a few feet to 195 feet in thickness. They have been described in Mr. David's Memoir on *The Geology of the Vegetable Creek Tin-mining Field*, 1887, and in my *Report on the Tin-bearing Country of New England, July*, 1873, which was republished in *Mines and Mineral Statistics of New South Wales*, 1875. I then referred them to Lower Miocene or Upper Eocene age on account of their lithological resemblance to the leaf-beds of Bacchus Marsh in Victoria, to which Professor McCoy assigned that age. This identification as to age has now been confirmed by Baron von Ettingshausen, upon the evidence of the large collection of fossil plants described in this able Memoir, in which reference is also made to other Tertiary plants from Australia and Tasmania in the British Museum, and to those described by Baron Sir Ferd. von Mueller, K.C.M.G., M.D., F.R.S., Government Botanist of Victoria, to whom we are much indebted for his determination of our Pliocene Tertiary Flora.

Apart from their geological value, the deductions of Baron von Ettingshausen have a very important bearing upon the origin of the living Flora not only of Australia, but also of other portions of the globe, and are thus of special interest to botanical science. The Baron points out that the Tertiary Flora of extra-tropical Australia is, as regards character, essentially distinct from the present living Flora of Australia, nor does it closely resemble in general any other living flora, but that it is nearly related to the Tertiary Flora of Europe, North America, and the Arctic Regions. He also states, what the investigations of Von Unger, Professor O. Heer, and other Palæontologists confirm, that the Tertiary Flora in general contains the elements of all the living floras of the globe. This conclusion he first based upon the occurrence in the European Tertiary Flora of *Alnus*, *Betula*, *Quercus*, *Sequoia*, *Acer*, *Pinus*, and other genera peculiar to the Northern Hemisphere, together with *Casuarina*, *Grevillea*, *Banksia*, *Dryandra*, *Leptomeria*, *Eucalyptus*, and other genera peculiar to the Southern Hemisphere. The American and Asiatic Tertiary Floras show the same, and it is now proved that the Tertiary Flora of Australia does not make any exception to it.

These important observations, taken in connection with the fact which I have elsewhere drawn attention to, that geological evidence tends to show that the higher parts of the Great Coast Range of Eastern Australia have not been submerged since the commencement of the Mesozoic era, may warrant the belief that the origin of the Australia Flora may be referred as far back as the Triassic Period. This portion of Australia, therefore, having presented a land surface from so remote a period, affords one of the most interesting regions of the globe for the investigation of the evolution of its Flora and Fauna.

I have the honor to be,
Sir,
Your obedient servant,
C. S. WILKINSON,
Geological Surveyor-in-Charge.

To Harrie Wood, Esq.,
Under Secretary for Mines.

EDITOR'S PREFACE.

THE duty of editing for the press the English translation of my friend the Baron von Ettingshausen's Memoir on the Tertiary Plants of Australia has given me the greatest possible pleasure, especially as it became one of my first duties on taking up the position of Palæontologist to the Geological Survey of New South Wales.

I have made no attempt to alter the form of the Memoir, or the wording of the translations, except where necessary to bring them in accord with the plan adopted for the future survey publications, or to render an original idiom more in keeping with its English equivalent.

A few foot-notes relating to Bibliography have been appended, in addition to a Chapter on the Stratigraphy of the Plant-bearing beds. Such additions are invariably placed in square brackets [ ].

The localities of the specimens described, so far as known, have been more clearly defined than in the original Memoir.

The figured specimens, unless otherwise stated, are in the Mining and Geological Museum (Department of Mines).

R. ETHERIDGE, JNR.

Sydney, October, 1888.

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CONTRIBUTIONS

TO THE

TERTIARY FLORA OF AUSTRALIA.

PART I.

Translated by Mr. Arvid Neilson, from the Original Memoir in the Denkschriften der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften, Wien, 1883, xlvii Bande.

I.—INTRODUCTION.*

Mr. C. S. Wilkinson, the Government Geologist of New South Wales, forwarded to the British Museum in London, for examination and determination, a collection of Tertiary Fossil Plants, collected by Mr. J. K. Hume, of Yass. Entrusted with the working out of this collection whilst at the British Museum, I had the opportunity, through the kindness of Dr. Henry Woodward and Mr. Robert Etheridge, Junior, of examining all the fossil plants of the Tertiary formations of Australia in the custody of that institution, and, through the courtesy of Mr. William Carruthers, the necessary material for a comparison between these fossils and living plants from the rich Herbarium of the same Museum. Sir Joseph Hooker, also, placed at my disposal for purposes of comparison, the magnificent Collections of the Botanical Museum and Conservatories of Kew Gardens.

Provided with such ample means, I was enabled to undertake a task which elsewhere, on account of the great difficulty of determining the fossil plants of a continent whose flora is so peculiar, would have been almost impossible. Hence my first duty is to render my most cordial thanks to the gentlemen named, for liberal assistance rendered by them to me.

The deeper insight which the Tertiary Flora of Europe has already been the means of affording, renders any information as to the, as yet almost unknown Tertiary Floras of the other parts of the world highly desirable, and every contribution to a knowledge of these floras should therefore be welcome. The Tertiary Flora of Australia, however, is of quite exceptional interest, for the following reasons:—

(1.) In the first place the question presents itself: What are the relations between the Tertiary Flora of this continent and the peculiarities of its present flora?

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* [An abstract of this Introduction appeared in the *Geological Magazine*, 1883, x, p. 153, written by Baron von Ettingshausen.—R.E., jnr.]

(2.) As the Tertiary Flora of Europe includes, amongst others, forms of plants also peculiar to Australia, the question arises: In what relation do these forms stand to those of the Tertiary Strata of Australia?

(3.) As the present flora of Australia contains, besides its peculiar forms of plants, others (originally indigenous) which are nearly allied to forms in other parts of the world, it becomes a question whether such not-exclusively Australian forms can be also traced in the Tertiary Flora of Australia.

Up to the present time, there are only a few Australian Tertiary Plants known which can be referred to the Pliocene Epoch. Most of these have been described by Baron Ferdinand von Mueller, Government Botanist, Melbourne, in his meritorious treatise published in the "Reports of the Mining Surveyors and Registrars of Victoria" for 1871*, 1872–78, and in the "Annual Report of the Department of Mines of New South Wales"† for 1876 and 1878. Other species were published by Professor McCoy, in Smyth's "Report of Progress Geological Survey of Victoria," 1874, and in the "Prodromus of the Palæontology of Victoria," Decade IV, 1876.

But, valuable as these treatises by F. von Mueller are as contributions to our knowledge of the Tertiary Flora of Australia, the material offered by them was still too meagre to enable us to arrive at any general conclusions as to the real nature of this flora. Nor can his researches as to the systematic position of several genera, established by him, be regarded as in any way finally determined, and many of them will, no doubt, hereafter have to be referred to genera still extant.

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* F'cap, Melbourne (Government Printer).

† [These Memoirs contain descriptions of New South Wales fossils, and are entitled—"Descriptive Notes on the Tertiary Flora of New South Wales." In the first (1876, p. 178), Seeds are described from the Deep Leads of Upper Pliocene age, at Gulgong. The following are a list of the species:—

Ochthodocaryon Wilkinsoni	*F. von M.*
Eisothecaryon semiseptatum	,,
Illicites astrocarpa	,,
Pentacoila gulgonensis	,,
Pleiacron elachocarpum	,,
Acrocoila anodonta	,,
Phymatocaryon bivalve	,,
Plesiocapparis leptocelyphis	,,
Spondylostrobus Smythii, var cryptaxis	,,

The whole were obtained from the auriferous gravel of the Black Lead, beneath basalt, at a depth of 160 feet, accompanied by leaves and trunks of trees.

The second Memoir (1878, p. 169, pls. 3 and 4) contains descriptions of most of the above species with figures, and also an additional fruit named *Wilkinsonia bilaminata*, also from the Black Lead of Gulgong.—R.E., jnr.]

The total amount of material at present available from various localities in Victoria, New South Wales, and Tasmania, embraces 98 species, representing all the principal classes of Vasculares, and, as regards age, all the principal strata of the Tertiary Formation.

We will first notice the general characters of the flora, and afterwards unfold the peculiarities of the different strata in particular, as far as this can be done with the material at hand. The most important general result is this:

The Tertiary Flora of extra-tropical Australia is, as regards character, essentially distinct from the present living flora of Australia; nor does it closely resemble, in general, any other living flora. On the other hand, it shows the mixed character of the Tertiary Floras of Europe, the Arctic Regions, North America, and, probably, all the Tertiary Floras. It has also much more similarity to the Tertiary Floras at present known than to the existing flora of Australia. The characteristic plants of Australia are but feebly represented.

I must point out here, that thus far the study of the Tertiary Floras has led to the general result, that in this flora all the elements of the different floras of the world are found combined—a result at which I first arrived in working up several local floras from the Tertiary formations of Austria, but which has been confirmed by Von Unger, in his "Fossilen Flora von Radobj," (p. 10). The labours of O. Heer, with regard to the Tertiary Flora of Switzerland, and the Arctic Regions; those of Count Saporta, with regard to the Tertiary Flora of France, and those of L. Lesquereux, with regard to the North American Tertiary Flora, also undoubtedly point to the same conclusion, although the authors named do not appear to have attached much importance to the fact. In considering only the Coniferæ of the Tertiary Flora, as at present known, consisting chiefly of branches, fruits, and seeds, we see represented, not merely all the orders and groups of the class, but all the different floral regions. In the Tertiary Coniferæ, therefore, we see a portion of the universal flora, which in itself already warrants the conclusion, that in the Tertiary Flora must be included the elements of all the floras.*

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* 1. During the Tertiary epoch the following groups of still living Coniferæ had representatives in Europe, the Arctic Regions, and North America:—*Ephedra* (Northern Hemisphere), *Araucaria* (South America and Oceania), *Pinus* (Northern Hemisphere), *Cunninghamia* (China), *Sequoia* (California), *Glyptostrobus* (China), *Taxodium* (North America and Mexico), *Widdingtonia* (South Africa), *Actinostrobus* (Australia), *Callitris* (North Africa), *Libocedrus* (America and Oceania), *Biotia* (China, Japan), *Chamæcyparis* (North America, Mexico, Japan), *Juniperus* (Northern Hemisphere), *Taxus* (Northern Hemisphere), *Ginko* (China, Japan), *Podocarpus* (Southern Hemisphere, China, Japan).

The described portion of the Tertiary Flora of Australia forms no exception to this rule. A glance at the accompanying table will show that it contains, not only many genera which occur also in the Tertiary Floras of Europe, North America, and Northern Asia, but, in general, representatives of the floral regions. These embrace Filices, Coniferæ, and all the principal classes of Dicotyledonæ. The genera *Myrica*, *Betula*, *Alnus*, *Quercus*, *Fagus*, and *Salix*, are characteristic of the European and North American floras; the *Castanopsis*, *Cinnamomum*, *Tabernæmontana*, *Premna*, *Elæocarpus*, and *Dalbergia*, point to East India and China; *Magnolia* especially to the warmer parts of North America; *Bombax* to tropical America; *Knightia* and *Coprosma* to Oceania. A comparatively few genera, such as *Lomatia*, *Banksia*, *Ceratopetalum*, *Pittosporum*, and *Eucalyptus*, are representatives of the existing flora of Australia*. Of the species, however, not one is identical with any species belonging to the Tertiary Floras named; but thirty-four species are more or less allied to species in those floras; and hence it follows that the Tertiary Flora of extra-tropical Australia is closely related to the Tertiary Floras of Europe, North America, and the Arctic Regions. Compared with the present flora of Australia, however, the Tertiary Floras named appear strikingly different; yet, inasmuch as they scarcely differ among themselves, we may, eliminating unimportant differences, consider them as forming together the common origin of all the extra-tropical floras of the earth.

The combination of the Tertiary floral-elements into a common original flora may be traced even as far as the grouping of the species of a genus. The present flora of Australia is devoid of the genus *Quercus*. In its Tertiary Flora, on the other hand, we can point to five species, of which two are analogous to those found in the East Indies, one to the Oceanian *Q. philippinensis*, one to the *Q. castaneæfolia* of the Caucasus and Northern Persia, and one to the *Q. stellata* of North America.

The Tertiary Floras of the tropics, to judge from the certainly very scanty material at present available, appear to differ from the Tertiary Floras of the extra-tropical regions of the earth, in so far that the first are more closely allied to the living floras than the latter. No doubt this greater similarity between the Tertiary and the existing tropical floras is owing to the fact that, in the interval between the Tertiary Epoch and the present age, the climatic conditions of the tropics have remained comparatively unaltered. At the same time, the analogy is very striking between the three

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* On a further exploration of the Tertiary Flora of Australia, the number of Australian genera will, no doubt, be considerably increased; but as this will also most likely be the case with the non-Australian genera no essential alteration in the mixed character of the floral elements need be looked for.

Tertiary Tropical Floras thus far explored* and the Tertiary Floras of the extra-tropical regions, more especially that of Europe. Besides this, it appears that the Tertiary Flora of Java, regarding which our data are the most complete, does not consist of exclusively Indian forms, but that its existing analogies extend over a far larger area than the present monsoon region; so that it may be said that in Java, even during the Tertiary Period, types of plants existed together which are now separated from one another by large tracts of the earth's surface. I will here only point to the occurrence of the genera *Cornus*, *Rhamnus*, and *Ceanothus*, as well as South American forms of Malpighiaceæ. The mixed character of the Tertiary Flora is therefore even here very plain, and will, no doubt, become still more striking, as these floras become more fully explored. It cannot be denied that, as far as known, the Tertiary Floras approach one another much more closely than the present floras of the earth do in their regions. The connecting link between the former consists in the common floral-elements.

The analogy referred to might perhaps justify the conclusion that the same connecting link binds together all the Tertiary Floras of the earth. From an evolutionary historical point of view, we might even speak of a universal original flora, to which all the present existing floras of the earth may be traced back.

As I have already stated elsewhere,† the evolution of the present flora from the Tertiary Flora took place through the differentiation of the floral climate, which, however, was effected differently in different parts of the globe.

This insight into the essence of the Tertiary Flora enables us also to dismember the floras of the present age in accordance with the mixing of the floral elements which once existed. As a general rule, one of the floral elements will be found to have undergone a predominant differentiation, from which the principal member originated which gave to the flora its distinguishing characteristic. But we also meet with forms which, although indigenous, are not in accordance with the character of the flora, but seem to point to an exotic flora. These exotic floral constituents cannot be immigrants, but must have survived into the present flora through the co-elements of the Tertiary Flora. From these latter the co-members have been developed.

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* H. R. Goeppert, Tertiärflora der Insel Java, 1854; O. Heer, Fossile Pflanzen von Sumatra, 1874; Beiträge zur Fossilen Flora von Sumatra, 1881; H. T. Geyler, über fossile Pflanzen von Borneo, 1875.

† History of the Development of the Vegetation of the Earth. *Sitzungsber. Math. Nat. Classe K. Akad. Wiss.* Wien, 1874, 69 Bd., 1 Abth.

In the present Flora of Australia* the principal member has been extraordinarily developed; the principal element must, therefore, have undergone a manifold differentiation of its constituents, so much the more as itself, as already stated, did not occupy a predominant position during the Tertiary Epoch. The generic relations of both are plainly expressed through the Proteaceae, the Myrtaceæ, *Ceratopetalum* and *Pittosporum*. Through the co-members the floras of the earth are linked one to the other. Hence we see even the Flora of Australia connected with those of the other parts of the world through numerous genera, of which up to the present time *Pteris*, *Araucaria*, *Fagus*, *Coprosma*, *Tabernæmontana*, *Premna*, *Elæocarpus*, *Dalbergia*, and *Cassia* may be referred to as regards the Tertiary Flora of Australia. These belong to the co-elements of the latter, as do also the genera *Myrica*, *Betula*, *Alnus*, *Quercus*, *Salix*, *Castanopsis*, *Cinnamomum*, *Laurus*, *Knightia*, *Cordia*, *Magnolia*, *Bombax*, and *Sapindus*, all wanting in the present Flora of Australia, but indicating the relationship of its Tertiary Flora to the Tertiary Floras of the other quarters of the globe.

So much for the general relations of the flora. The detailed examination of it, however, offers some data which places in the clearest light the above-mentioned generic connection between the living flora and a common original flora. The *Fagus risdoniana* from the Tertiary strata of Risdon, in Tasmania, differs so slightly from the *Fagus Deucalionis*, Unger, from the European and North American Tertiary strata, that the identity of the one with the other may indeed be conjectured. *Fagus Moorei* at present living in Australia, is no doubt, a descendent of *F. risdoniana*, just as the European *F. sylvatica* and the North American *F. ferruginea* now living, have descended from *F. Deucalionis*, which is in itself only a progressively developed form of *F. Feroniæ*, Unger. This close affinity between the various species of beech in Europe, North America, and Australia is not to be accounted for by immigration, nor by any absurd hypothesis as to a connection in former times between the continents of Europe and America with Australia, but simply through the Tertiary Flora, which contains the still more closely connected architypes of these species. The *F. risdoniana* is descended from

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* The Generic Connections of the Australian Flora. *Denkschriften*, loc. cit. xxxiv Bd. Guided by the opinion that in the floras of the present time the floral elements of the Tertiary times cannot have disappeared without leaving some vestage behind, I have made an attempt in this treatise to divide the Flora of Australia into members, and to trace each of these back to a floral element. Thus the numerous characteristic plants of this flora were referred to the principal member, and the East Indian, Oceanic, American, European, and African forms to the co-members, in which, of course, only the indigenous species were taken into account, to the exclusion of all immigrants or introduced species. As these, from their character of non-Australian species, could not have found their way into the present flora of Australia otherwise than through the Tertiary Flora, the conclusion was arrived at from the facts themselves, that in the Tertiary Flora of Australia a mixture of floral elements similar to that in Europe existed—a conclusion which is directly confirmed in the present treatise.

F. Wilkinsoni, of the Eocene strata of Dalton, in New South Wales, which is related to the first just as the *F. Feroniæ* is related to the *F. Deucalionis*.

As regards the relative age of the Tertiary Flora of Australia, the following general results may be deduced from the materials at hand :—

The Eocene Flora of Dalton contains, amongst twenty-seven species of plants, only two which belong to the principal element, *i.e.*, only 7·4 per cent. of characteristic plants ; but, on the other hand, 52 per cent. of species which indicate a tropical climate. The peculiar genera are proportionately much fewer than the genera common to the European Tertiary Flora, as far as these are at present known. The Eocene Flora of Australia, therefore, differs more from the present flora of that continent, and less from the Tertiary Flora of Europe.

The Miocene Flora of Australia, as known from specimens hitherto found in different localities in New South Wales and Tasmania, contains, amongst thirty-two species, four which are characteristic, *i.e.*, 12·5 per cent. of the principal element. The number of species pointing to a tropical climate are reduced by 34·3 per cent., so that the number of the peculiar genera has, in comparison with the Eocene Flora, increased. In the Miocene Epoch, therefore, the principal element of the flora was already more developed in Australia than during the Eocene Epoch.

Of the specimens of the Pliocene Flora which have been discovered in several localities in Victoria and New South Wales, peculiar genera and species have already been described, the majority of which may be regarded as characteristic plants.

The Pliocene Flora of Australia, therefore, shows a further development of the principal element, and is marked by a greater divergence from the previously existing floras.

So that to the question first propounded above, as to the relation subsisting between the Tertiary Flora and the peculiarities of the present living flora, we may now reply that these peculiarities have been chiefly differentiated from their original forms, at a somewhat late period towards the end of the Tertiary Epoch, or, perhaps, at the beginning of the present epoch. This element, which is here the principal, but in the other Tertiary Floras only a co-element, developed already in Pliocene times a series of peculiar genera, which, however, again disappeared on the advent of the present epoch.

At the same time, the second question, as to the relations between the Australian forms of plants in the European Tertiary Flora and the Australian Tertiary plants, is answered also. The first-named form only a co-element of the flora, the latter embraces several floral elements, of which only the principal can be compared to the former. That the non-Australian indigenous forms of plants (co-members) of the living flora of Australia are generically to be referred to the co-elements of the Tertiary Flora, has already been shown, and thus the third of the questions propounded above has been answered also.

Before I proceed to the description of the fossil plants, I must notice briefly the localities whence they have been obtained.

(a.) DALTON, NEAR GUNNING, NEW SOUTH WALES.

The fossil plants of this locality are found in layers of clay, sand, and marl, which are ferruginous. Similar strata occur also in New England.* Mr. C. S. Wilkinson regards these strata as at least Lower Miocene. The rocks of these formations, on account of their coarse and siliceous nature, are not very favourable for the preservation of plant remains. As the leaf-impressions are nevertheless very distinct, it is to be assumed that the leaves must have been of a very firm and leathery texture. I have determined twenty-seven species of fossil plants from this locality, belonging to seventeen orders and twenty-one genera. Of peculiar interest is the *Pteris Humei*, a species discovered by Mr. J. K. Hume, and analogous to the *P. tremula*, which is still living in Australia; a species of *Alnus;* four species of Oak, among which *Quercus Darwini,* related to *Q. bidens,* Heer, from the Tertiary of Sumatra, and *Q. Hookeri,* corresponding to *Q. laurophylla,* Goeppert, from the Tertiary of Java; *Fagus Wilkinsoni,* a beech, intermediate between a species found in the Cretaceous and another Tertiary species; a *Castanopsis,* analogous to the Eocene *C. mephitidioides,* Gey. sp., from Borneo; two species of *Cinnamomum,* analogous to species from the European Tertiary Flora; a species of *Laurus* analogous to the Tertiary *L. Swoszowiciana;* a species of *Apocynophyllum*, resembling on the one hand *A. Reinwardtianum*, Goeppert, of the Tertiary Flora of Java; a species of *Tabernæmontana;* two species of *Magnolia;* two species of *Bombax*, &c. Among these, however, there are no forms of specifically Australian character, which would appear to have retreated into the background altogether. A *Pittosporum* and a *Eucalyptus* are the only plants of the kind. Excepting one single Proteacean, which corresponds to a New Zealand genus, the locality in question has so far furnished 7·4 per cent. of Australian types. This great difference between the Fossil Flora of Dalton and the present flora of Australia renders the supposition very probable, that between the two floras a long interval of the Tertiary Epoch intervened. This supposition is further specially strengthened by a comparison of the affinities of the species. We find in the Fossil Flora of Dalton three approaches to Cretaceous species, viz., through *Quercus drimejoides* to the *Q. primordialis*, Lesq., of the Cretaceous Flora of Nebraska; through *Fagus Wilkinsoni* to the *F. prisca*, Ett., of the Fossil Flora of Niederschöna; and finally through *Magnolia Brownii* to the *M. tenuifolia*, Lesq., of the North American Cretaceous Flora. Two species, viz., *Quercus Darwini* and *Castanopsis Benthami*, are related to species of the British Eocene Flora. Besides this, species of the genera *Artocarpidium*, *Eucalyptus*, *Dalbergia*, and *Cassia*, are analogous to species belonging more particularly to the European Eocene Flora. For these reasons I regard the Fossil Flora of Dalton as Eocene.

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* *Vide* Mines and Mineral Statistics, 1875, p. 87.

(*b.*) TERTIARY STRATA NEAR HOBART, TASMANIA.

In the environs of Hobart are found extensive strata of yellowish, solid limestone (Travertin), in which now and then, sometimes often, fossil plants are embedded. Among the localities known are Risdon, Shoebridge's Lime-kiln, Geilston, Pipeclay Bluff, Carnelian Bay, Sandy Bay, One-tree Point, and others, near the embouchure of the river Derwent. The geological relations of these strata have been carefully examined and described by Mr. R. M. Johnston, of Hobart, to whose writings I here refer.* In the

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* [The Geological Papers, by Mr. R. M. Johnston, referred to, are the following:—

Regarding the Composition and Extent of certain Tertiary Beds in and around Launceston, Tasmania. *Papers and Proc. R. Soc. Tas. for 1873*, pp. 34—48.

The Launceston Tertiary Basin; Second Paper. *Loc. cit.* for 1874, pp. 53—62.

Note on the Discovery of *Spondylostrobus Smythii* (Von Mueller), and other Fossil Fruits in the Deep Lead Drift at Brandy Creek Gold-field. *Loc. cit. for 1879*, p. 25.

Notes on the Relations of the Yellow Limestone (Travertin), of Geilston Bay, with other Fluviatile and Lacustrine Deposits in Tasmania and Australia, &c. *Loc. cit. for 1879*, pp. 81-90.

British Museum, I examined a collection of fossil plants from Risdon, which is one of the richest Tertiary deposits of this region, as well as a collection of fossil plants labelled "Erebus and Terror." These latter were found in Tertiary Travertin, near Hobart Town, by Dr. R. McCormick, the surgeon accompanying the ships "Erebus" and "Terror" during an expedition to the Antarctic Regions.

Finally, I have determined also a series of fossil plants from the Derwent district, near Hobart, figured by Mr. Johnston in one of his latest works, cited below.

From the apparently rich flora embedded in these strata, 34 species ranging over 21 genera and 16 families, have up to the present been brought to light. Of these, I would name *Araucaria Johnstoni*, F. v. M.; ***Myrica Eyrei***, nearly allied to the Miocene ***M. salicina; Betula derwentensis***, corresponding to the Miocene ***B. Brongniartii; Alnus Muelleri***, analogous to the ***A. gracilis***, Ung.; *Quercus Tasmanii*, analogous to the *Q. palæococcus*, Ung., of the Fossil Flora of Radoboj; ***Fagus risdoniana***, very nearly allied to the Miocene ***F. Deucalionis***, Ung.; *Salix Cormickii*, analogous to the Upper Tertiary, ***S. varians***, Goeppert; ***Cinnamomum Woodwardii*** corresponding to the Miocene ***C. Scheuchzeri***, Heer; ***Lomatia prælongifolia***, analogous to the ***L. borealis***, Heer, of the European Tertiary Flora, and the *L. Torreyi*, Lesq., of the North American Tertiary Flora; *Dryandroides Johnstoni*, corrresponding to the still living species of *Banksia* and *Dryandra; **Coprosma præcuspidifolia***, very nearly allied to the living Australian *C. cuspidifolia*, De Cand.; *Echitonium obscurum*, related to the *E. macrospermum* of the European Miocene; *Elæocarpus Bassii*, closely allied to the *E. Albrechti*, Heer, of the Miocene Flora of Europe; ***Sapindus tasmanicus*** corresponding to the *S. falcifolius*, A. Braun, of the last-mentioned flora; ***Cassia Flindersii***, analogous to *C. ambigua*, Ung.; besides species of the genera *Apocynophyllum*, ***Cordia***, *Premna*, *Sapotacites*, and *Ceratopetalum*.

To these may now be added :—

Note showing that the Estuary of the Derwent was occupied by a Freshwater Lake during the Tertiary Period. *Loc. cit. for 1880*, pp. 7-21, 11 plates.

Descriptions of new species of Fossil Leaves from the Tertiary Deposits of Mount Bischoff, belonging to the genera *Eucalyptus*, *Laurus*, *Quercus*, *Cycadites*, &c. *Loc. cit. for 1885*, pp. 322-325, plates 1 and 2.

Descriptions of two New Species of Tertiary Fossil Plants belonging to the genera *Eucalyptus* and *Taxites*. *Loc. cit.*, pp. 335-337.

Description of some Fossil Leaves from Mount Bischoff. *Australian Sci. Mag.*, 1885, I, No. 3, p. 45.

Note on the Discovery of Plant Remains in the Tertiary Marine Beds at Table Cape, Tasmania. *Papers and Proc. R. Soc. Tas. for 1886-1887*, p. xx.

It will also be advisable to consult MUELLER (Sir F. VON). Observations on New Vegetable Fossils [*Araucaria Johnstoni*] of the Auriferous Drifts. *Reports Mining Surveyors* and *Registrars, Victoria, 1876 (Sept.), No.* 83, *App.*, p. 39, plate 18; *also* Observations on New Vegetable Fossils of the Auriferous Drifts, Decade 2, 1873 (8vo., Melbourne, 1873), p. 16, plate 18. R.E., jnr.]

This Tertiary Flora stands nearer to the present flora of Australia than does the Fossil Flora of Dalton. The species are mostly analogous to Miocene species, and hence I conclude, that the Travertin strata of Hobart Town belong to the Miocene Formation.

(c.) TERTIARY STRATA IN VICTORIA.

The fossiliferous strata of Nintingbool, Haddon, Tangil, Smythe's Creek, Eldorado, &c., which furnished the most important material for Baron Ferdinand v. Mueller's Treatises, quoted above, have been referred to the Pliocene formation. The many peculiar genera and species which characterise the Fossil Flora of these strata do not as yet permit any comparison with the flora of the previously quoted Tertiary strata, nor with any other. Some few of the genera might be referred to this place in the system, as, for example, *Spondylostrobus* to the Coniferæ; *Conchocaryon* and *Celyphina* to the Proteaceæ; *Trematocaryon* to the Verbenaceæ; *Phymatocaryon* and *Tricœlocaryon* to the Sapindaceæ. But, as regards the majority, their systematic position is still doubtful or undetermined. Two of the species have been found also in the strata of the Derwent district, viz., *Conchotheca turgida*, F. v. M., at Beaconsfield, and *Platycoila Sullivani*, F. v. M., at Geilston; also the genus *Penteune*, although as a peculiar species.

(d.) LATER TERTIARY STRATA IN NEW SOUTH WALES.

The localities of Gulgong, Bathurst, Lumpy Swamp, Richmond River, and Beneree, in New South Wales, whose deposits of fossil plants have been made known through the labours of Baron von Mueller, ought likewise to be referred to the Pliocene formation.

These localities are distinguished by several peculiar genera, such as *Rhytidocaryon*, *Illicites*, *Liversidgea*, *Ochthodocaryon*, *Eisothecaryon*, *Pentacoila*, *Acrocoila*, and *Wilkinsonia*.* One of the species *Plesiocapparis leptocelyphis*, F. v. M., occurs also in the Derwent district, at Geilston and Pipeclay Bluff.

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* [In connection with the fossils here mentioned by Baron Ettingshausen, the following papers, by Sir F. von Mueller, may be consulted :—

Description of Fossil Fruits *(Liversidgea)* in a Siliceous Deposit, Richmond River, New South Wales. *Journ. R. Soc., New South Wales, 1876*, x, p. 239, plate.

Ottelia præterita, F. von M. *Loc. cit.*, 1880, xiii, p. 95, plate 3. R.E., jnr.]

II.—Table Showing a comparison of the Tertiary Flora of

Systematic enumeration of Species.	Occurrence in Australia.	Tertiary Flora of Europe.
CRYPTOGAMÆ.		
Filices.		
Pteris Humei, Ett.	Dalton, near Gunning, N. S. W.	P. inæqualis, *Heer*
PHANEROGAMÆ.		
GYMNOSPERMÆ.		
CONIFERÆ.		
Spondylostrobus Smythii, *F. v. M.*	Haddon, River Tangil, Eldorado; Brandy Creek Gold-field	
Araucaria Johnstonii, *F. v. M.*	Geilston Quarry, near Hobart Town, Tasmania.	
MONOCOTYLEDONES.		
Microrrhagion Liversidgei, *Ett.*	Wallerawang, N. S. W.	
DICOTYLEDONES.		
Apetalæ.		
MYRICACEÆ.		
Myrica Eyrei, *Ett.*	Derwent District, Tasmania	M. salicina, *Ung.*
BETULACEÆ.		
Betula daltoniana, *Ett.*	Dalton, near Gunning, N. S. W.	B. prisca, *Ett.*
,, derwentensis, *Ett*	Derwent District, Tasmania	B. Brongniartii, *Ett.*
Alnus Muelleri, *Ett.*	Dalton; Risdon, Derwent District	A. gracilis, *Ung.*
CUPULIFERÆ.		
Quercus Hookeri, *Ett.*	Dalton, near Gunning, N. S. W.	Q. nereifolia, *A. Braun*
,, præphilippinensis, *Ett.*	Dalton, near Gunning, N. S. W.	
,, drymejoides, *Ett.*	Dalton, near Gunning, N. S. W.	Q. Drymeja, *Ung.*
,, Darwinii, *Ett.*	Dalton, near Gunning, N. S. W.	Q. bournensis, *D. Hpe.* Q. lonchitis, *Ung.*
,, Tasmanii, *Ett.*	Risdon, Tasmania	Q. palæococcus, *Ung.*
Fagus Wilkinsoni, *Ett.*	Dalton, near Gunning, N. S. W.	F. prisca, *Ett.* F. Feroniæ, *Ung.*
,, risdoniana, *Ett.*	Risdon, Tasmania	F. Deucalionis, *Ung.*
Castonopsis Benthami, *Ett.*	Dalton, near Gunning, N. S. W.	
SALICINEÆ.		
Salix Cormickii, *Ett.*	Hobart Town, Tasmania	S. varians, *Goepp.*
MOREÆ.		
Ficonium Solandri, *Ett.*	Dalton, near Gunning, N. S. W.	
ARTOCARPEÆ.		
Artocarpidium Stuartii, *Ett.*	Dalton, near Gunning, N. S. W.	A. intigrifolium, *Ung.* A. bilinicum, *Ett.*
LAURINEÆ.		
Cinnamomum polymorphoides, *McCoy*	Dalton, near Gunning, N. S. W.	C. polymorphum, *A. Braun*
,, Leichardtii, *Ett.*	Dalton, near Gunning, N. S. W.	C. spectabile, *Heer*
,, Woodwardii, *Ett.*	Shoebridge, Tasmania	C. Scheuchzeri, *Heer*
,, hobartianum, *Ett.*	Hobart, Tasmania.	
Laurus australiensis, *Ett.*	Dalton, near Gunning, N. S. W.	L. Swoszowiciana, *Ung.*
,, werribeensis, *McCoy*	Werribee River, Victoria.	
,, sp. adhuc. ind., *Smyth*	Bacchus Marsh, Victoria	
Daphnogene sp. adhuc. ind., *Smyth*	Bacchus Marsh, Victoria.	
PROTEACEÆ.		
Lomatia prælongifolia, *Ett.*	Derwent District, Tasmania	L. borealis, *Heer*
Knightia daltoniana, *Ett.*	Dalton, near Gunning, N. S. W.	K. Nimrodis, *Ung.*, sp.
Banksia sp. adhuc. ind., *Red.*	Creswick, Chiltern, Victoria.	

AUSTRALIA with other Tertiary and the existing Floras.

Tertiary Flora of the Arctic Zone.	Tertiary Flora of North America.	Tertiary Flora of Sumatra and Borneo.	Existing Flora.
Pteris sp.	Pteris sp.	....	P. tremula, *R Brown*, Australia.
M. lingulata, *Heer*	M. Bolanderi, *Lesq.*	....	M. integrifolia, *Roxb.*, East Indies.
B. Miertschingi, *Heer.*	B. Vogdesii, *Lesq.*	....	B. Rojpalthra, *Wall*, Nepaul.
B. Brongniartii, *Ett.*	B. Goepperti, *Lesq.*	....	B. carpinifolia, *S. et Z.*, Japan.
A. gracilis, *Ung*	A. americana, *Ett.*	....	A. viridis, *D. C.*, Europe.
....	Q. eucalyptifolia, *Ett.*	Q. laurophylla, *Goepp.*, Java	Q. Amherstiana, *Wall*, East Indies.
	Q. straminea, *Lesq.*		
	Q. cineroides, *Lesq.*		
....	....	....	Q. philippinensis, *D.C.*, Philippine Islands.
Q. grœnlandica, *Heer*	Q. primordialis, *Lesq.*	....	Q. castaneæfolia, *C. A. Meyer*, Asia Minor.
	Q. Drymeja, *Ung.*		
....	Q. fraxinifolia, *Lesq.*	Q. bidens, *Heer*, *sp.*, Sumatra...	Q. oxyodon, *Miq.*, East Indies.
....	....	....	Q. stellata, Wngnh. Q. bicolor, Willd. .. } North America.
F. Feroniæ, *Ung.*	F. polyclada, *Lesq.*	....	F. Moorei, *F. v. Muell.*, Tasmania.
....	....	....	F. ferruginea, *Ait.*, North America.
F. Feroniæ, *Ung.*	F. Feroniæ, *Ung.*	....	F. ferruginea, *Ait.*, North America.
....	....	C. mephitidioides, *Gey.*, sp., Borneo.	C. argentea, *D.C.*, var., Martabanica, Martaban.
S. varians, *Goepp.*	S. tabellaris, *Lesq*	....	S. fragilis, *L.*, Europe.
....	....	Ficus sp., Java, Sumatra	
....	....	Artocarpidium (?)	
....	C. polymorphum, *A. Br.*	C. javanicum, *Geopp.*, sp., Java	C. Camphora, *L.*, Japan.
C. Kanii, *Heer*, sp.	C. mississipiense, *Lesq.*		
C. Scheuchzeri, *Heer* (?)	C. Scheuchzeri, *Heer*	....	C. pedunculatum, *Thbg.*, Japan.
Laurus sp.	L. socialis, *Lesq*	Daphnophyllum sp., Java.	
....	....	Litsæa Boettgeri, *Gey.*, Borneo.	
....	L. Torreyi, *Lesq.* sp.	....	L. longifolia, *R. Br.*, Australia.
....	....	....	K. excelsa, *R. Br.*, New Zealand.

II.—TABLE Showing a comparison of the TERTIARY FLORA OF

Systematic enumeration of Species.	Occurrence in Australia.	Tertiary Flora of Europe.
PROTEACEÆ—continued.		
Conchocaryon Smithii, *F. v. M*	Victoria	...
Celyphina Maccoyi, *F. v. M.*	Haddon, Tangil River, Victoria.	
Conchotheca (?) rotundata, *F. v. M*	Nintingbool, Victoria.	
,, turgida, *F. v. M.*	Nintingbool, Victoria; Derwent District, Tasmania.	
Dryandroides Johnstonii, *Ett.*	Derwent District, Tasmania	D. hakeæfolius, *Ung.* D. brevifolius, *Ett.*
Gamopetalæ.		
RUBIACEÆ.		
Coprosma præcuspidifolia, *Ett.*	Derwent District, Tasmania	Cinchonidium coprosmæfolium, *Ett.*
APOCYNACEÆ.		
Apocynophyllum Etheridgei, *Ett.*	Dalton, near Gunning, N. S. W.	...
,, travertinum, *Ett.*	Derwent District, Tasmania	A. Reussii, *Ett.*
,, microphyllum, *Ett.*	Derwent District, Tasmania.	
Tabernæmontana primigenia, *Ett.*	Dalton, near Gunning, N. S. W.	T. bohemica, *Ett.*
Echitonium obscurum, *Ett.*	Hobart, Tasmania	E. macrospermum, *Ett.*
BORAGINEÆ.		
Cordia tasmanica, *Ett.*	Risdon, Derwent District, Tasmania	...
VERBENACEÆ.		
Premna Drummondii, *Ett.*	Derwent District, Tasmania	...
Trematocaryon Maclellani, *F. v. M*	Nintingbool, Eldorado, Victoria.	
SAPOTACEÆ.		
Sapotacites oligoneuris, *Ett.*	Derwent District, Tasmania	S. minor, *Ett.*
,, achrasoides, *Ett.*	Derwent District, Tasmania	Achras lycobroma, *Ung.*
Dialypetalæ.		
SAXIFRAGACEÆ.		
Ceratopetalum Woodii, *Ett.*	Risdon, Tasmania	...
,, præarbutifolium, *Ett.*	Derwent District, Tasmania	C. bilinicum, *Ett.*
MENISPERMACEÆ.		
Rhytidocaryon Wilkinsoni, *F. v. M.*	Lumpy Swamp,* W. of Bathurst, N. S. W.	
MAGNOLIACEÆ.		
Magnolia Brownii, *Ett.*	Dalton, near Gunning, N. S. W.	M, Dianæ, *Ung.*
,, Torresii, *Ett.*	Dalton, near Gunning, N. S. W.	...
Illicites astrocarpa, *F. v. M.*	Gulgong, N. S. W.	
CAPPARIDEÆ (?).		
Liversidgea oxyspora, *F. v. M.*	Richmond River, N. S. W.	
Dieune pluriovulata, *F. v. M.*	Haddon, Victoria.	
Ochtodocaryon Wilkinsoni, *F. v. M.*	Gulgong, N. S. W.	
Plesiocapparis leptocelyphis, *F. v. M.*	Gulgong, N. S. W.; Derwent District.	
,, prisca, *F. v. M.*	Haddon, Victoria.	
STERCULIACEÆ.		
Bombax Sturtii, *Ett.*	Dalton, near Gunning, N. S. W.	B. oblongifolium, *Ett.*
,, Mitchelli, *Ett.*	Dalton, near Gunning, N. S. W.	...
TILIACEÆ.		
Elæocarpus Bassii, *Ett*	Derwent District, Tasmania	E. Albrechti, *Heer*
OLACINEÆ (?).		
Eisothecaryon semiseptatum, *F. v. M*	Gulgong, N. S. W.	
SAPINDACEÆ.		
Sapindus tasmanicus, *Ett.*	Derwent District, Tasmania	S. falcifolius, *A. Br.*
Pentacoila gulgonensis, *F. v. M.*	Gulgong, N. S. W.	
Penteune brachyclinis, *F. v. M.*	Smythe's Creek, Victoria.	

[* Probably Lumpy Lead, Forest Reefs, about 18 miles from Orange.—R.E., jnr.]

AUSTRALIA with other Tertiary and the existing Floras—*continued.*

	Tertiary Flora of the Arctic Zone.	Tertiary Flora of North America.	Tertiary Flora of Sumatra and Borneo.	Existing Flora.
	....	....	....	Hakea.
	....	D. Cleburni, *Lesq.*	....	Banksia æmula, *R. Br.*; Dryandra, sp., Australia.
	....	Cinchonidium Copeanum, *Lesq.*, sp	....	Coprosma cuspidifolia, *D.C.*, Australia.
	.... A. Heerii, *Ett.*	.... A. Lesquereuxii, *Ett.*..............	A. Reinwardtianum, *Goepp.*, Java	Ochrosia maculata, *Jacq.*, Bourbon Isld. Alstonia macrophylla, *Wall*, Philippine Islands.
	.... E. lanceolatum, *Ett.*	....	....	T. laurifolia, *L.*, Jamaica.
	....	....	....	Cordiæ sp.
	....	....	....	Premnæ sp.
	S. solidus, *Heer* sp..........	S. Copeanus, *Ett.*	....	Mimusops sp. Achras sapota, *L.* Tropics.
	....	C. americanum, *Ett.*	.. ..	C. gummiferum, *Smith*, Australia. C. arbutifolium, Australia.
	M. regalis, *Heer.* .... M. Nordenskiöldi, *Heer.* ...	M. tenuifolia, *Lesq.* .... M. Lesleyana, *Lesq.*	Magnoliastrum sp.	Magnoliæ sp.
	....	....	....	B. floribundum, *Schtt.*, Brazil. B. grandiflorum, *Cav.*, Brazil.
	....	....	....	E. (Ganitrus) sphæricus.
	S. defunctus, *Heer*..........	S. caudatus, *Lesq.* .... S. obtusifolius, *Lesq.*	Sapindus sp., Sumatra............	Sapindus sp.

II.—TABLE showing a comparison of the TERTIARY FLORA OF

Systematic enumeration of Species.	Occurrence in Australia.	Tertiary Flora of Europe.
SAPINDACEÆ—continued.		
Penteune Clarkei, *F. v. M.*	Smythe's Creek, Eldorado Mines, Beechworth, Victoria.	
,, trachyclinis, *F. v. M.*	Smythe's Creek, Eldorado Mines, Beechworth, Victoria.	
,, Allporti, *F. v. M.*	Geilston, Tasmania.	
Phymatocaryon angulare, *F. v. M.*	Smythe's Creek, Victoria.	
,, bivalve, *F. v. M.*	Smythe's Creek, Victoria.	
,, Mackayi, *F. v. M.*	Haddon, Tangil River, Eldorado Mines, Victoria	
Tricœlocaryon Barnardi, *F. v. M.*	Victoria.	
PITTOSPOREÆ.		
Pittosporum priscum, *Ett.*	Dalton, near Gunning, N. S. W.	P. cuneifolium, *Ung.*
CELASTRINEÆ.		
Celastrophyllum Cunninghami, *Ett.*	Dalton, near Gunning, N. S. W.	Celastrophyllum sp.
RHAMNEÆ.		
Pomaderites Banksii, *Ett.*	Dalton, near Gunning, N. S. W.	R. rectinervis, *Heer.* Berchemia multinervis, *Heer.*
CALYCIFLORÆ.		
Acrocoila anadonta, *F. v. M.*	Gulgong, N. S. W.	
MYRTACEÆ.		
Eucalyptus Delftii, *Ett.*	Dalton, near Gunning, N. S. W.	E. oceanica, *Ung.*
,, obliqua, *l'Herit*	(?) Malmsbury and Daylesford, Victoria.	
,, Pluti, *McCoy*	Daylesford, Victoria.	
PAPILIONACEÆ.		
Dalbergia Diemenii, *Ett.*	Dalton, near Gunning, N. S. W.	D. primæva, *Ung.*
CÆSALPINIEÆ.		
Cassia Cookii, *Ett.*	Dalton, near Gunning, N. S. W.	C. phaseolites, *Ung.*
,, Flindersii, *Ett.*	Derwent District, Tasmania	C. ambigua, *Ung.*
Leguminosites Kennedyi, *Ett.*	Dalton, near Gunning, N. S. W.	Leguminosites sp.
PLANTÆ INCERTÆ SEDIS.		
Odontocaryon Macgregorii, *F. v. M.*	Nintingbool, near Haddon, Victoria.	
Platycoila Sullivani, *F. v. M.*	Nintingbool, near Haddon, Victoria. Derwent District, Tasmania.	
Pleiacron elachocarpum, *F. v. M.*	Gulgong, N. S. W.	
Rhytidotheca Linchii, *F. v. M.*	Nintingbool, near Haddon, Victoria.	
,, pleioclinis, *F. v. M.*	Nintingbool, near Haddon, Victoria.	
Wilkinsonia bilaminata, *F. v. M.*	Bencree, Gulgong, N. S. W.	
Xylocaryon Lockii, *F. v. M.*	Nintingbool, Victoria.	
Carpolithes gærtnerioides, *Ett.*	Derwent District, Tasmania.	
,, risdonianus, *Ett.*	Risdon, Tasmania.	
Phyllites populiformis, *Ett.*	Derwent District, Tasmania.	
,, ficiformis, *Ett.*	Derwent District, Tasmania.	
,, juglandiformis, *Ett.*	Derwent District, Tasmania.	
,, ligustroides, *Ett.*	Derwent District, Tasmania.	
,, pyriformis, *Ett.*	Derwent District, Tasmania.	
,, phaseolites, *Ett.*	Derwent District, Tasmania.	
,, sophoræformis, *Ett.*	Derwent District, Tasmania.	
,, mimosæformis, *Ett.*	Derwent District, Tasmania.	

AUSTRALIA with other Tertiary and the existing Floras—*continued.*

Tertiary Flora of the Arctic Zone.	Tertiary Flora of North America.	Tertiary Flora of Sumatra and Borneo.	Existing Flora.
....	....	....	Pittosporum sp.
....	Celastrophyllum sp.	Celastrophyllum sp., Java	
R. rectinervis, *Heer*.	Rhamnus rectinervis. *Heer*.	Rhamnus sp., Java	Pomaderris sp., Australia.
....	Berchemia multinervis, *Heer*. . .	....	Rhamnus sp., North America.
			Berchemia sp., North America.
E. siberica, *Heer*..	E. americana, *Lesq.*	....	Eucalyptus sp., Australia.
....	D. Lesquereuxii, *Ett*.	Dalbergia sp., Sumatra	Dalbergiæ sp.
....	....	....	Cassiæ sp.
....	C. podogonioides, *Ett.*	....	Cassiæ sp.

III.—DESCRIPTION OF THE SPECIES.

CRYPTOGAMÆ.

Filices.

PTERIS HUMEI, *sp. nov.*[*]

Plate I, Figs. 1–6.

Sp. Char.—P. fronde in superiore parte bi-, in medio et inferiore parte tri-pinnatipartita, segmentis oppositis alternisque, integris vel lobatis vel incisis, distantibus vel approximatis, oblongis, obtusis vel acuminatis, lobis ovatis vel abbreviato-ovatis, apice obtusis vel acutiusculis, integerrimis vel crenulatis, vel obsolete dentatis; nervatione Alethopteridis genuinæ; nervo primario angulis acutis egrediente, recto, subprominente, apicem versus valde attenuatis; nervis secundariis subangulis acutis orientibus.

Obs.—The fragments of fronds here figured (Pl. I, figs. 1–6), were obtained from a rather large piece of rock, and belong most probably to one and the same individual. This possessed a frond of considerable size, characterised by the variation in the composition, form, and arrangement of the segments. The upper portion of the frond is twice pinnate, as shown in Fig. 6, which is a representation of such a portion; in this, the primary pinnæ are joined to the rachis at acute angles, lanceolate to linear-lanceolate, always acuminate; secondary pinnæ oblique, ovate, entire, more or less elongate, rounded at the apex, or merely obtuse; the middle and inferior portion of the frond, according to the other remains represented on Plate I, shows distinctly a more complex arrangement. The primary pinnæ are here prolonged, lanceolate, or elongate, the secondary ones placed at various acute angles, oblong, entire or sinuate, or indistinctly dentate or lobed, more or less narrowed towards the apex, rounded or merely obtuse or acuminate; the tertiary pinnæ are broad at the base, shortly ovate or even more shortened, entire, obtuse, or acuminate. In the pinnæ shown in Figs. 1 and 2, the tertiary ones are only partially developed, whereas Figs. 4 and 5 are derived from portions of fronds which had perhaps attained a still more complex arrangement.

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[*] [It must be distinctly understood that the abbreviated words, "*sp. nov.*," are retained here simply as a portion of the translation of Professor Ettingshausen's memoir. The species ceased to be new on the publication of the work in its original German form.—R.E., jnr.]

The characters described agree with no other genus of fern so well as with *Pteris*. Among living species of the genus, we find in the Australian *Pteris tremula*, R. Brown, an analogous representative of the fossil. Of fossils hitherto described, the *P. inæqualis*, Heer, from the Tertiary of Switzerland, may be regarded as the most nearly related species.

I name this species after Mr. J. K. Hume, of Yass, an enthusiastic Geologist, who discovered the specimens figured.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

MONOCOTYLEDONES.

Microrrhagion Liversidgei, *sp. nov.*[*]

Plate I, Figs. 7–11.

Sp. Char.—M. inflorescentia cymoso-paniculata, pedunculis dichotome ramosis; fructibus baccatis exsiccatis, subglobosis.

Obs.—Several corresponding fragments of a fruiting branch, lying together in a greyish-brown schist. They disclose a cymose inflorescence; the flower stalks are dichotomously branched, their stems remarkably broad and flat, finely striated. When in their natural state, however, these latter were probably not so compressed as they appear in the impression; they must have been amplexicant, very fine, and succulent. The fruits, enlarged in Figs. 8–11, are very small, almost globose, the surface finely and irregularly wrinkled, indicative of its probably berry-like character.

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[*] [This species is not a Tertiary form. See foot-note on the next page.—R. E., jnr.]

The fossil cannot at present be referred to any existing genus; but from the habit of the described inflorescence, it belongs undoubtedly to the Monocotyledones. It was sent to the British Museum for examination by Professor Liversidge,* in honour of whom I have named it.

Locality and Horizon.—Wallerawang, New South Wales; shale of Upper Devonian or Lower Carboniferous age.

Collection.—The University, Sydney.

DICOTYLEDONES.

Apetalæ.

MYRICACEÆ.

MYRICA EYREI, *sp. nov.*

Plate I, Fig. 12.

Johnston, Notes, etc.,† Papers and Pro. R. Soc. Tasmania, for 1881 [6th Plate], Fig. 5.

Sp. Char.—M. foliis petiolatis coriaceis, oblongis, basi acutis, apice obtusiusculis, margine integerrimis; nervatione camptodroma; nervo primario valido, excurrente; nervis secundariis simplicibus vel ramosis, angulo subrecto exeuntibus.

Obs.—This leaf agrees very well with similar fossil *Myrica* leaves, with entire margin and coriacious texture, to *M. depertita*, *M. salicina*, and *M. integrifolia*, Ung., of the European Tertiary Flora, and the *M. lingulata*, Heer, from the Tertiary Flora of Greenland, although its identity with either one or the other is impossible. In the North American flora these species are represented by *Myrica Bolandri*, whose leaves are coriaceous, entire, and dentate only at the apex.

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* [Or, rather, formed part of a general collection sent by Professor Liversidge to the undersigned for determination. The beds from which this fossil was obtained are of Upper Carboniferous age. It was placed, unfortunately by an oversight, with other Tertiary specimens, and hence Baron Ettingshausen was misled.—R.E., jnr.]

† [Notes showing that the estuary of the Derwent was occupied by a freshwater lake during the Tertiary Period. *Loc. cit.*, pp. 7-21, 11 plates (not numbered). R.E., jnr.]

I dedicated this species to the memory of the Australian explorer, Edward John Eyre, whose exploring journeys in the interior of the continent were as difficult as they were important.

Locality and Horizon.—One-tree Point, and Pipe-clay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania*; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

BETULACEÆ.

BETULA DALTONIANA, *sp. nov.*

Plate I, Fig. 13.

Sp. Char.—B. foliis ovatis, obsolete dentatis; nervatione craspedodroma; nervo primario distincto, recto; nervis secundariis angulis acutis variis egredientibus, rectis, tenuibus, basim versus approximatis.

Obs.—Although only a fragment of a leaf, there are just sufficient data to establish its apetalous character beyond a doubt. There are only two orders to which it could possibly be referred, viz., the Betulaceæ and the Cupuliferæ, and amongst these it is especially the species of the genera *Betula* and *Fagus* which, from the described pecularities of the leaf, must be compared with the fossil in question. It is strange, however, that whereas the character of the venation, namely, the presence at the base of the leaf of more approximate, less obliquely inserted, and not considerably shorter secondary veins, would place our fossil among the *Betulæ,* the pecularities of form and the character of the margin agree better with *Fagus.* But as the character of the venation is in most cases of great importance, I have placed the leaf in the first-named genus, and suppose that in this instance we have to do with a peculiar beech-like birch. That both genera named occur in the Tertiary Flora of Australia, is clearly proved from other fossils described in the sequel.

Among hitherto described fossil species, we have in the *Betula Miertschingi,* Heer (Flora Foss. Arct., I, Pl. XII, fig. 9), one that is very analogous to the Australian one, and in which only the dentate character of the margin is more decided. In the Tertiary Flora of North America, the *Betula Vogdesii,* Lesq., in the European Tertiary Flora the *B. prisca,* Ett., and in the existing Flora the *B. Rojpalthra*, Wall. (the analogue of the last named), from Nepaul, are the only ones which can be regarded as representative species.

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* [In the paper by Mr. R. M. Johnston quoted, the localities are separately given in a few cases only. This is intended as a general one, simply to indicate that part of the Derwent Estuary from which the plants were collected.—R.E., jnr.]

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

BETULA DERWENTENSIS, *sp. nov.*

Plate I, Fig. 14.

Johnston, Notes, etc., Papers and Pro. R. Soc. Tasmania, for 1881 [6th Plate], Fig. 10.

Sp. Char.—B. foliis petiolatis ovatis, acuminatis argute denticulatis; nervatione craspedodroma; nervo primario distincto recto; nervis secundariis subangulis acutis egredientibus, rectis prominentibus, basem versus approximatis.

An ovate, petiolate, acuminate leaf, whose marginal character and venation point directly to the genus *Betula*. As regards hitherto published fossil species, *B. derwentensis* approaches most closely the *B. Brongniartii*, Ett., and as regards those still living, the analogue of the lastnamed *B. carpinifolia*, Sieb. & Zucc., from Japan. In the Tertiary Flora of North America, we find a similar species, the *B. Goepperti*, Lesq., which, as well as *B. sachalinensis*, Heer, from the fossil flora of Sachalin, may be regarded as representative species.

Locality and Horizon.—One-tree Point and Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

ALNUS MUELLERI, *sp. nov.*

Plate I, Figs. 15–17.

Sp. Char.—A. strobilis parvis gracilibus ellipticis, squamis lignescentibus curvatis imbricatis; foliis petiolatis ovatis, serratis; nervatione craspedodroma; nervo primario prominente; nervis secundariis subangulis 50–60° orientibus, leviter arcuatis, simplicibus vel apice furcatis; nervis tertiariis paucis distinctis inter se conjunctis.

Obs.—A fruiting cone (Plate I, fig. 15), and leaves demonstrate the occurrence of the genus *Alnus* in the Tertiary Flora of Australia. The first was recognised by me in the British Museum, among the collection of fossil plants from Risdon, near Hobart, Tasmania. According to its diameter at the middle, it occupies a position between the cones of *Alnus Kefersteinii*, Goepp., sp., and *A. sporadum*, Ung., on the one hand—and between those of *A. gracilis*, Ung., and *A. cycladum*, Ung., on the other hand. With reference to the character of the scales, it approaches the two last named, which have thin and often somewhat incurved scales. Our species is, however, distinguished from these species by somewhat more robust and more incurved scales.

The leaf shown in Fig. 16 is derived from the Tertiary strata near the mouth of the River Derwent, in Tasmania. It also approaches closely the form of the leaves of *A. gracilis* and *A. cycladum*. As regards the more prominent connective tertiary veins it approximates most closely the leaves of *A. cycladum*, from the Fossil Flora of Kumi (compare Unger, *loc. cit.*, Pl. III, figs. 18 and 19).

The leaf shown in Pl. I, fig. 17, from a ferruginous sandstone from Dalton, near Gunning, appears to me to belong to *A. Muelleri*, although the tertiary veins are wanting, owing to the composition of the embedding rock being unfavourable to preservation.

I dedicated this species to Baron Ferdinand von Mueller, the Government Botanist in Melbourne.

As its nearest analogues in the Tertiary Flora of Europe (inclusive of the Arctic zone) we may regard *Alnus gracilis*, Ung., and in the Tertiary Flora of North America, *A. americana*, Ett.

As regards the extent of the former, and the study of the latter species, I may be permitted to make the following remarks:—

In the "Miocene Flora of the Baltic" (page 67), Dr. O. Heer has given an elaborate review of those fossil alder leaves which he regards as belonging to *Alnus Kefersteinii*, Ung. On the other hand, he has failed to find in that flora any leaves corresponding to the *A. gracilis*, Ung., whose independence will be conceded on account of the discovered cones, although the fruiting cones of both species occur, and it is therefore most probable that the leaves of both species have also been preserved among the great number of alder leaves found. In my opinion Heer has referred the leaves of *A. gracilis* to *A. Kefersteinii*, which would account for the fact that he has found no leaves which he could assign to the fruiting cones of the *A. gracilis*. The only leaf (Plate XIX, fig. 14, of the work quoted), which he designates as *A. gracilis*, is not an alder leaf, inasmuch as it shows plainly looped and more approximate secondary veins, which do not occur in *Alnus*. On the other hand, at least the leaves figured under Figs. 3 and 4 in the same work belong to that species, as I found from the fruiting branch of the *A. gracilis* from Leoben, in connection with which there is a leaf almost perfectly identical with the leaf numbered 3 just referred to. It is probable that Fig. 8, as well as the leaves of *Alnus Kefersteinii parvifolia*, Heer, in general should also be referred to this species.

I certainly agree with Heer in his opinion that the alders which occur in the Fossil Flora of Kumi are only forms of *A. Kefersteinii* and *A. gracilis*. I have before me well-preserved leaves of both from the strata of Kumi. Amongst these the leaves of *A. Kefersteinii* appear to be much more rare, and, in his "Fossilen Flora von Kumi," Unger has figured one of them, an imperfectly preserved leaf fossil, whose margin is wanting, as *A. sporadum*. All the leaves designated by him as *A. cycladum*, however, belong to *A. gracilis*, and not to *A. Kefersteinii*, as supposed by Heer.

I have yet to consider the occurrence of *A. gracilis* in the Tertiary Flora of Iceland, not only as regards the fruit, but also as regards leaves. The fruiting cones, Pl. XXV, figs. 4b, 5, 6, 7, in O. Heer's Flora Fossilis Arctica, Part I, are erroneously designated as *A. Kefersteinii*; their correspondence with those of *A. gracilis* is so apparent that they must undoubtedly belong to the latter species. Of the few and generally very imperfectly preserved alder leaves which have been found in the tertiary strata of Iceland, the fragment of a leaf, Pl. XXV, fig. 19, in the work above quoted, corresponds both as regards dentation and venation to the one designated and figured as *A. Kefersteinii parvifolia*, in Pl. XIX, fig. 2, in the "Miocene Flora of the Baltic." As the latter, however, as already observed, is referable to *A. gracilis*, we must refer this one also to the same species, on account of the leaf fragment, Fig. 19, which fossil cannot possibly belong to *Betula macrophylla*, to which Heer has referred it. That a birch fruit is occasionally found in the same piece of rock, together with the fragment of leaf referred to, cannot deprive the above argument of its force. Besides this, the birch fruit agrees very well with the leaf fragment, Fig. 18, whose well-preserved dentate margin and venation point more clearly to a birch leaf. Finally, as the fruiting cones of the *A. gracilis* occur in the tertiary strata of Iceland, no doubt can be entertained that the leaf remains of this alder would also be found.

With reference to the *Alnus americana** the analogue of *A. Muelleri* in the North America Tertiary Flora, I would like to add the following: The leaf designated as *Betula Goepperti* by Lesquereux in his "Contributions to the Fossil Flora of the Western Territories" (Part II, Pl. XVII, figs. 23 and 23A) has a doubly dentate margin, and differs in this, as well as to some extent in the venation, from the leaf fossils of the species named. It betrays more the habit of an alder leaf than of a birch leaf, namely, as regards the broadly ovate form and the somewhat unequal base, and points to the existence of a second species of alder in the Tertiary Flora of North America. So far, only one alder has been published from this flora, which cannot be distinguished from the *Alnus Kefersteinii* of the European Tertiary Flora, whilst the second species referred to, whose diagnosis is appended below, is most nearly allied to the *A. gracilis*, from which it differs in its dentate margin and its more approximate tertiary veins.

Locality and Horizon.—Risdon, Tasmania; in yellow Travertin of Upper Tertiary age.† One-tree Point and Pipeclay Bluff, Carnelian Point, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds. Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

Collections.—British Museum (Natural History Branch), and R. M. Johnston, respectively.

CUPULIFERÆ.

QUERCUS HOOKERI, *sp. nov.*

Plate II, Figs. 5 and 6.

Sp. Char.—Q. foliis coriaceis petiolatis, oblongis vel lanceolatis acuminatis integerrimis; nervatione camptodroma; nervo primario valido, recto, prominente, excurrente; nervis secundariis sub angulis 65–75° orientibus, inæqualibus approximatis, distinctis apice ramosis; nervis tertiariis angulis acutis exeuntibus, tenuibus, marginem versus inter se conjunctis.

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* *Alnus Americana*, sp. nov. Foliis rotundato-ovatis, basi subobliquis, apice acuminatis, margine duplicato-dentatis; nervatione craspedodroma; nervo primario basi prominente, apicem versus attenuato; nervis secundariis subangulis 30–40° orientibus, distinctis subarcuatis, marginem versus valde attenuatis; nervis tertiariis angulo recto insertis, tenuibus approximatis, inter se conjunctis. In a Tertiary formation at Evanston, Wyoming, North America.

† [With regard to the age of the Yellow Travertin met with near Hobart at Geilston, Risdon, and other places, Mr. R. M. Johnston believes it to be the equivalent of "the extensive fluviatile and lacustrine formations in Australia, particularly at Haddon, Bacchus Marsh, Malmsbury, ... Gulgong, Richmond River, Orange, &c." (*Papers and Pro. R. Soc. Tasmania for 1879* [*1880*], p. 83).—R.E., jnr.]

Obs.—In this fossil the coriaceous texture is very pronounced, in consequence of the well-defined impression which it has left in the sandstone. It shows a robust petiole, which ultimately merges into the strongly marked midrib. The form of the leaf is oblong to lanceolate, the base acuminate; towards the apex it is narrowed, according to the fossils at hand; the margin is entire. The proportionately rather fine secondary veins issue at slightly acute angles, are unequal, approximate, dividing at a considerable distance from the margin, and forming loops with their branches. The tertiary veins spring at acute angles from the secondary ones, are fine, short, and merging towards the margin gradually into the loop-forming branches. The leaf reticulation has not been preserved in the coarse stone matrix; but the remaining traces show that the meshes must have been very minute, and the reticulation very complex.

These characters would assign the leaf in question to the genus *Quercus*, which also appears under some other very characteristic forms in the Fossil Flora of Australia, as will be shown in the sequel. Of hitherto known fossil oaks, no one approaches the *Quercus Hookeri* so closely as the *Quercus nereifolia*, A. Braun (Heer, Tertiary Flora of Switzerland, Part II, Pl. LXXIV, figs. 1–4, and Pl. LXXV, fig. 2). The first-named species has, however, stiffer and proportionately broader leaves, and more distant and more obtuse-angled secondary veins; on the other hand, the *Q. nereifolia* has subcoriaceous, elongate-lanceolate leaves, with more numerous secondary veins. Whilst, therefore, the latter agrees best with *Quercus imbricaria* and *Q. Phellos*, our species, as regards form, consistence, and venation of the leaf, approaches more closely the East Indian *Q. Amherstiana*, Wall. (Pl. VII, fig. 10), and *Q. fenestrata*, Roxb. (Pl. VII, fig. 4). The *Quercus nereifolia*, A. Braun, does not occur in the Tertiary Flora of North America; in its stead we find three other species of oak with entire leaves, viz., *Q. straminea*, Lesq., *Q. cineroides*, Lesq., and *Q eucalyptifolia*,* which may be regarded as more remote analogues of the *Q. Hookeri*. On the other hand, a closely allied species, the *Q. laurophylla*, Goepp., occurs in the Tertiary Flora of Java. This only differs from the first in its more feeble midrib, and stronger, curved, and non-anastomosing secondary veins.

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* *Quercus eucalyptifolia*, sp. nov.—Foliis rigide coriaceis, ovato-lanceolatis, basi acutis, margine integerrimis; nervatione camptodroma; nervo primario valido prominente; nervis secundariis subangulis 45–55° orientibus, tenuibus simplicibus.

The leaf fossil represented on Plate XXI, fig. 3, in the above quoted work by Lesquereux, cannot be identical with the leaves of *Quercus chlorophylla*, Ung., as has been supposed. The latter have a different form, never broadest at the base, with the secondary veins numerous, very approximate, and issuing at more obtuse angles. The texture of these leaves is coriaceous, but not to the same extent as those of the fossil referred to. Their strong texture and form give them a eucalyptus-like appearance.

I name this species in honor of my highly esteemed friend, Sir Joseph D. Hooker.

Locality and Horizon.—Dalton, near Gunning; in hard, siliceous grit, reposing on Silurian rocks.

QUERCUS PRÆPHILIPPINENSIS, *sp. nov.*

Plate II, Fig. 7.

Sp. Char.—Q. foliis coriaceis brevissime petiolatis, ovatis, basi rotundatis, apicem versus angustatis, margine integerrimis; narvatione camptodroma; nervo primario valido, recto, prominente, apicem versus attenuato; nervis secundariis paucis subangulis 40–50° orientibus, distinctis, arcuatis marginem versus adscendentibus; nervis tertiariis tenuissimis transversis, approximatis.

Obs.—This leaf shows very characteristic peculiarities, and its determination is quite easy. The strong impression left by the margin, and the principal veins in the stony matrix, is evidence of the strong coriaceous texture of the leaf. The petiole is very short, its length being scarcely 2 millimètres. The blade is ovate, rounded at the base, narrowed towards the apex. The apex itself has not been preserved, but judging from the direction of the converging margins it must have been prolonged. The strongly marked margin is entire. The very characteristic venation shows a midrib very strong at the base, gradually tapering until it becomes lost at the apex, with only five acute-angled and camptodromic secondary veins on each side, very prominent at their origin, ascending, and very fine as they approach the margins, and with numerous very fine perfectly transverse tertiary veins. The intervening reticulation, probably very fine, has not been preserved, but is nevertheless indicated in one spot in the second secondary segment near the midrib.

The fossil described belongs undoubtedly to the section *Cyclobalanus*, Endl., of the genus *Quercus*. We find in this section among the species with entire leaves some with transverse tertiary veins, and amongst these latter the *Q. philippinensis*, De Cand., with whose leaves our fossil agrees in all essentials most closely. The *Quercus philippinensis*, (Pl. VII, fig. 2.) whose only habitat in the existing flora is the Philippine Islands has stiff, coriaceous, shortly petiolate, ovate to ovate-lanceolate, acuminate, entire leaves, with camptodromic venation; from the very prominent midrib spring on either side 5–7 strongly curved secondary veins, ascending towards the margin at angles of 40° to 50°. The tertiary veins, which, on an average, are 1 millimètre distant from one another, are connected, and perfectly transverse. Of species belonging to the section named, which are found in tropical Asia, and show a similar character in their leaves, although not so nearly allied to the fossil species as the *Q. philippinensis*, may be mentioned *Q. Champione*, Benth., from the island of Hongkong, and *Q. costata*, Blume, from Java.

Among other genera of different orders in which similar leaves or, more especially, leaves with transverse tertiary veins occur, I would adduce *Pterospermum*, *Cornus*, *Berchemia*, *Rhamnus*, *Hiræa*, and *Banisteria*. The leaves of *Pterospermum* have always a stronger development of the tertiary veins, at least on the outer side of the lower secondary veins. In *Cornus* all, or at least the uppermost, secondary veins are acrodromic. In *Berchemia* and those species of *Rhamnus* which on account of their transverse tertiary veins may be adverted to in this connection, the secondary veins are numerous, and the tertiary veins mostly still finer and more approximate than in the above-mentioned species of *Quercus*, section *Cyclobalanus*, and besides the texture of the leaves is never so strong as in these. In *Hiræa* and *Banisteria* the tertiary veins are flexuose or bent, and in *Banisteria* the secondary veins are in addition more numerous.

Of hitherto known fossil species of oak, none is closely allied to the *Q. præphilippinensis*.

Locality and Horizon.—With the preceding species.

QUERCUS DRYMEJOIDES, *sp. nov.*

Plate III, Fig. 2.

Sp. Char.—Q. foliis coriaceis petiolatis lanceolatis basin et apicem versus angustatis, margine grosse dentatis; nervatione craspedodroma; nervo primario valido recto prominente, apicem versus attenuato; nervis secundariis validis, subangulis 35–45° orientibus, numerosis simplicibus rectis vel subarcuatis, excurrentibus, spinulam formantibus; nervis tertiariis tenuissimis angulo subrecto exeuntibus, simplicibus vel furcatis, inter se conjunctis.

Obs.—That this fossil leaf belongs to *Quercus* can scarcely be doubted. Judging from the peculiarities of the impression, the texture of the leaf must be regarded as coriaceous. The leaf is petiolate; but the length of the petiole cannot be stated exactly, because it appears broken in the impression, and probably only a small portion has been preserved. The form is lanceolate, the base acuminate, and the apex, although only imperfectly preserved, may, according to its lower portion, be recognised as narrowed. The margin is roughly dentate; some of the teeth show short spines; probably all the teeth were provided with such, although they mostly appear indistinct in the impression. The venation is perfectly craspedodromic. From the strongly prominent, straight, and tapering midrib, proceed, at rather acute angles, numerous sharply-defined, simple, straight, or only slightly bent secondary veins, terminating in the teeth. The tertiary veins are very fine, mostly branched, connected, and proceeding on both sides of the secondaries at almost right angles. The finer reticulation between the tertiary veins is only very imperfectly preserved in the impression.

The leaf described belongs to a species of oak coming under the section *Lepidobalanus*, Endl; but although among the species of that section there are a great number which show leathery, dentate, craspedodromic, prominently veined leaves, more or less similar to the fossil, I conclude from their comparison, that among existing oaks the Asiatic *Quercus castaneæfolia*, C. A. Meyer (Pl. VII, fig. 5), is the species which must be considered as most nearly allied to the *Q. drymejoides*. It is also nearly related to the *Q. Libani*, Oliv. (Pl. VII, fig. 7). Of fossil species of oak hitherto described, *Q. primordialis*, Lesq., from the Cretaceous Flora of Nebraska, agrees best with our species. The species named differs only in its somewhat more obtuse-angled and less ascending secondary veins. In all other characters the correspondence is most complete. Among tertiary oaks known up to the present, *Quercus Drymeja*, Ung., *Q. furcinervis*, Rossm. sp., *Q. grœnlandica*, Heer,[*] and *Q. pseudocastanea*, Goepp., resemble, as regards form of leaf, more or less the *Q. drymejoides.* As regards the dentate margin, however, the *Q. Drymeja* and *Q. pseudocastanea* differ more from our species than the above-mentioned oak of the Cretaceous Flora, and the *Q. grœnlandica* and *Q. furcinervis,* differ more in their venation. The described leaf fossil differs from the *Castanea* leaves in its leathery texture.

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[*] According to Heer's definition of this species, there would seem to be scarcely any variation at all in the form of its leaves. The leaves of all species of oak, however, show great variability in size, marginal character, and venation. (Compare the leaves of *Quercus stellata* on Pl. VII, figs. 1, 3.) Of course the variations in the leaf of a fossil plant can only be established when its leaves are of frequent occurrence and promising material for investigation is obtainable. At Atanekerdluk, one of the richest deposits of plant remains, the leaf remains of *Quercus grœnlandica* occur in enormous quantities, and surely the rich collections which through the industry and perseverance of the explorer of the extreme North have already been made must contain numerous forms and varieties of this oak. Heer has, however, referred them to other species. I shall here only mention a narrow-leaved form which approaches the Australian *Q. drymejoides*, and which has been determined by Heer as *Q. Drymeja*, in his "Flora Fossilis Arctica" (Part I, Pl. XI, figs. 1 and 2). Its teeth have the same direction as in the *Q. grœnlandica*, the dental sinuses are obtuse-angled, the tertiary veins directed abruptly upwards, and the texture scarcely coriaceous. In *Q. Drymeja*, Ung., however, the teeth have a more forward direction. The included sinuses being in consequence very acute-angled, the tertiary veins are not ascending, and the texture is coriaceous.

Locality and Horizon.—With the preceding species.

QUERCUS DARWINII, *sp. nov.*

Plate II, Fig. 3.

Sp. Char.—Q. foliis subcoriaceis, lanceolatis, acuminatis, basi integerrimis; nervatione craspedodroma; nervo primario recto, basi valido, apicem versus angustato; nervis secundariis distinctis, subangulis 40-50° orientibus, approximatis, subrectis, apicem versus abbreviatis; nervis tertiariis inconspicuis.

Obs.—This fossil, on account of its great similarity with the leaves of *Quercus bidens,* Heer, sp., of the Tertiary Flora of Sumatra, *Q. bournensis,* de la Harpe, and *Q. lonchitis,* Ung., of the European Tertiary Flora, and finally those of the still existing *Q. oxyodon,* Miq., from the East Indies (Pl. VII, fig. 6), can also scarcely be referred with more right to any other genus than *Quercus.* In form it corresponds with the last no less than it corresponds with the two first as regards dentation and venation, more especially in respect to the more numerous secondary veins. *Q. bidens* has, as its analogous species, *Q. Lobbii,* Hf. and G., with the leaves rounded at the base. The Australian genus *Callicoma* might also be mentioned here, in which we meet with lanceolate and dentate leaves, with craspedodromic venation. These, however, have a rougher dentation, which extends to the base, a thicker texture, and the more prominent secondary veins issue at more obtuse angles.

I dedicated the species in memory of the immortal founder of phytogenetic science, Charles Darwin.

Locality and Horizon.—With the preceding species.

QUERCUS TASMANII, *sp. nov.*

Plate II, Fig. 4.

Sp. Char.—Q. foliis coriaceis oblongis, undulato-lobatis, lobis integerrimis; nervatione e camptodroma et craspedodroma mixta; nervo primario valido, prominente; nervis secundariis prominentibus, subangulis acutis orientibus, inter se remotis, subflexuosis, marginem versus attenuatis; nervis tertiariis angulo subrecto exeuntibus flexuosis, ramosis et inter se conjunctis, rete tenerrimum includentibus.

Obs.—A fragment of a leaf, whose venation, fortunately, is so well preserved that its determination is quite possible. The texture of the leaf, according to the impression, appears to be coriaceous. A restoration of the fragment at both ends would give the leaf an oblong form. The margin has been preserved in two places only, and if restored would appear at least undulato-lobate, but otherwise entire. The lobate character of the leaf may be regarded as certain from the casually preserved incision in the margin on one side. The portion of the margin preserved on the opposite side enables us to recognise its undulate character. The venation of the mere middle portion of a leaf at hand shows a strongly prominent midrib, from which the secondary veins proceed at rather considerable distances from one another, forming angles of 50° to 60°. The secondary veins are prominent, not rectilinear, but somewhat flexuose. In the specimen before us there is present on one side a stronger and longer secondary vein, which at the place of fracture appears as if it were proceeding towards a lobe, and may most probably be regarded as craspedodromic. On the other side, a shorter camptodromic secondary vein is perfectly preserved. At the lower end of the leaf fragment may be observed on either side a much finer secondary vein, in closer proximity to a stronger one, with which it alternates. At an equal distance downwards, again, a stronger secondary vein may be traced; for these two lesser distances added together about equal the distance between the stronger secondary veins. The much finer tertiary veins proceed from both sides of the secondary veins at almost right angles, are flexuose, branching, and often conjoined, and enclosed by these lies a very fine net, composed of square meshes, as shown in the enlargement of the venation, Fig. 4A.

From a consideration of the above described characters, it does not seem too hazardous to assign the leaf fragment before us to the genus *Quercus*, since no other genus is known in which, as regards venation, form, and texture, there is discernible such a striking resemblance with the described fossil as in *Quercus stellata*, Wangenh., (Pl., VII, figs. 1 and 3), and *Q. bicolor*, Willd. I therefore hold these two North American oaks to be the nearest living relatives of the *Q. Tasmanii.*

Amongst fossil species of oak, I believe it approaches most closely the *Q. palæococcus*, Ung. The leaves of that oak, which have been found only in the Fossil Flora of Radoboj, and that only once, being one of the rarest species of the Tertiary Flora, resemble in their form, texture, and most characters of venation the leaf of our species. They are distinguished from it, however, by the different angles of departure of their tertiary veins. Of the *Quercus palæococcus* there is, besides the leaf, also an acorn, which, however, is more like the almost globose acorn of the *Quercus lyrata*, Walt.; whilst the leaf, as regards the angle of departure and course of the tertiary veins, points more directly to the *Q. alba*, Linn. It appears in this case, as in so many others, that in the fossil species the properties of different existing species of the same group are united, thus indicating the genetic relationship of the latter with the former as the original species.

I named the species after Abel J. Tasman, the discoverer of Tasmania.

Locality and Horizon.—Risdon, Tasmania; in yellow Travertin of Upper Tertiary age.

Collection.—British Museum (Natural History Branch).

FAGUS WILKINSONI, *sp. nov.*

Plate II, Fig. 1.

Sp. Char.—F. foliis coriaceis, ovato-oblongis, basi acutis apicem versus angustatis, margine undulato-dentatis, dentibus remotis obtusissimis, simplicibus vel denticulatis; nervatione craspedodroma; nervo primario paullo prominente, recto, apicem versus attenuato; nervis secundariis subangulis 40-45° orientibus, tenuibus, simplicibus; nervis tertiariis angulo recto exeuntibus tenuissimis abbreviatis ramosis, ramis inter se conjunctis, rete tenerrimum formantibus.

Obs.—The size and dentation, as well as the venation, of this leaf, point to *Fagus*. The impression betrays a thick coriaceous texture, an ovato-oblong form, narrowed abruptly towards the base, and gradually towards the apex, the margin remotely dentate, with the teeth very obtuse, or almost undulate. The margin of the teeth is entire, or else that of the larger ones shows a shallow denticulation. The venation shows a slightly prominent, straight, and, towards the apex, gradually narrowed midrib, and remarkably thin, acute-angled, simple secondary veins, 6–7 on each side, proceeding almost directly towards the teeth. The tertiary veins proceed on both sides of the secondaries at right angles; they are very fine and short, and merge immediately into a very fine net, composed of almost rectangular, oblong meshes. (Compare the enlargement of the venation in Fig. 1A.)

The described beech leaf, as regards its characters, occupies an intermediate position between the *Fagus prisca*, Ett., of the Cretaceous Flora, and the Miocene *Fagus Feroniæ*, Ung. In its generally simple dentation and the coriaceous texture, it reminds us of the former but in its venation of the latter; whilst the form of its leaves, the arrangement of the marginal teeth, and the small number of its secondary veins are common to both. We may, therefore, regard *F. Wilkinsoni* as a species whose leaves in several of their characters still represent the beech of the Cretaceous Epoch, but which, as regards their most important character, that of the venation, already announce a beech of the Miocene Period. The *F. Wilkinsoni*, nevertheless, possesses peculiar characters, by which it is distinguished from both of the beeches named, more especially the fine secondary veins, and the very short immediately anastomosing tertiary veins. In addition to this, the obtuseness of the teeth, which gives an almost undulate appearance to the margin, constitutes a peculiarity in our species. From these facts it may be concluded that *Fagus Wilkinsoni* forms an independent link in the chain of evolution of the beeches, and also that this link, as regards time, belongs to a period intervening between that of the Cretaceous and Miocene species, or the Eocene Period.

I have found it exceedingly interesting to compare the leaves of *Fagus Wilkinsoni* with the leaves of still existing Australian beeches. There are three species of the genus *Fagus* now living in Australia. *F. Moorei*, F. Muell., represents, as regards the form of the leaf, to some extent the North American *F. ferruginea*, Ait., but has thick coriaceous leaves. The latter are ovate or lanceolate, acuminate; the margin of the leaves and the venation are quite like those of *F. ferruginea*. In one leaf of a specimen of the *F. Moorei*, in the Royal Herbarium at Kew, I observed an indication of the double indentation of the margin. In the same place I found on a smaller leaved branch of this species all the leaves doubly dentate in this manner, and between the teeth at the extremities of the secondary veins there are inserted either teeth of almost equal size, or else there are between the principal teeth and their secondary veins smaller teeth, making the double dentation appear more distinctly. *Fagus Moorei* has particularly the same leathery texture and generally simply dentate leaf as *F. Wilkinsoni*, and is nearly related to it even as regards the size, form, and venation of the leaf. *F. Moorei* differs chiefly from *F. Wilkinsoni* only in its more numerous, more obtuse-angled, and more prominent secondary veins. The supposition that there is a genetic connection between the two species cannot, therefore, be wrong. We need only assume that between the *F. Wilkinsoni*, which we recognise as Eocene, and the still existing species there is at least one intermediate link, and the chain is complete. Even if this link had not been discovered, we might conclude from the close relationship between *F. Moorei* and *F. ferruginea*, that it must have been a descendent from the ancestral species of the latter. Fortunately, however, the intermediate link referred to has been discovered among the plant remains of the more recent Tertiary Strata of Tasmania, as will be shown in the sequel.

Fagus Cunninghami, Hook. fil., has also thick, leathery, but smaller elliptical, or more often ovate, not seldom obtusely triangular leaves. The mostly broader obtuse base is shortly petiolate; the margin is usually simply dentate; the teeth are obtusely rounded, and directed forwards. On the dorsum of the tooth there is often a shallow notch, which may be regarded as an indication of double dentation. This supposition is borne out by the fact that the notch is nearer to the base than to the apex of the tooth, and especially by the not infrequent occurrence of two unequal notches as the result of a somewhat deeper cutting into the tooth. The secondary vein terminates in the greater or principal tooth. From a specimen with rather larger leaves in the Royal Herbarium at Kew, collected by Mr. R. Gunn, I have obtained the following particulars relative to the venation. A fine, somewhat flexuose midrib extends to the apex of the leaf. The secondary veins are very fine, 3–5 on each side, issuing at angles of 40° to 50°, and branching towards the margin. The marginal teeth, therefore, are reached only by branches of the secondary veins. Tertiary veins are few, and dictyodromic, forming a loose net.

Although this species in its smaller leaves, and especially in the small number of secondary and tertiary veins, differs more from the *Fagus Wilkinsoni* than the former, it is nevertheless allied to it on account of the similar texture of the leaf, and the fine, not prominent secondary veins. A genetic relationship between the former and the latter is therefore still probable.

Fagus Gunnii, Hook. fil., has deciduous, almost herbaceous, small, broad leaves, of ovate-elliptical form. They are obtuse at both ends, and the margin proportionately crenate. As regards venation, these leaves differ essentially from those of the two former Australian species, inasmuch as the secondary veins do not terminate in the teeth of the margin, but in the sinuses between them. On each side of the midrib issue five secondary veins, very prominent underneath. The tertiary veins are very fine, short, merging into a delicate net. This species differs from *Fagus Wilkinsoni* mostly in its deciduous leaves and in its venation. It belongs to another group, and must have descended from a peculiar and as yet unknown ancestral species.

I named the above described fossil species in honor of C. S. Wilkinson, Esq., F.G.S., Government Geologist of New South Wales, who has rendered much valuable service in connection with the geology of the Australian region referred to.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

FAGUS RISDONIANA, *sp. nov.*

Plate I, Figs. 18–20.

Sp Char.—F. foliis coriaceis ovatis vel ovato-oblongis, utrinque acutis, vel apice acuminatis, margine simpliciter vel rarius duplicato-dentatis; nervatione craspedodroma; nervo primario paullo prominente, recto, apicem versus attenuato; nervis secundariis numerosis, subangulis 45–50° orientibus, distinctis simplicibus; nervis tertiariis angulo subrecto exeuntibus tenuissimis simplicibus, vel ramosis, inter se conjunctis et rete tenerrimum includentibus.

Obs.—The beech leaves from the tertiary strata of Risdon (Pl. I, figs. 18–20), belong certainly to only one species, differing only slightly from one another as regards size and form. As regards their characters, these leaves are intermediate between those of the still existing *F. Moorei*, F. Muell., and the above described *F. Wilkinsoni*. According to the best preserved specimen (Fig. 20) the texture must be regarded as coriaceous. The form is ovate-oblong, the base more or less acuminate, the apex somewhat prolonged, the margin distinctly dentate, the teeth generally simple; but in Fig. 18 the dentation becomes double towards the apex. The venation is perfectly craspedodromic, the midrib comparatively somewhat prominent; the secondary veins are more numerous, and also somewhat more strongly developed than in *F. Wilkinsoni*, and their originating angles more obtuse, thus clearly indicating an approach to the *F. Moorei*. The tertiary veins are very fine, branching and connected, and, together with the leaf net, very similar to those of the living species referred to. (Compare the enlargement of the venation, Fig. 20A.)

The *Fagus risdoniana* also betrays much analogy, on the one hand, with the Miocene *F. Deucalionis*[*] (the progressive form of the *F. Feroniæ*, Ung.), from which it is distinguished only by the thicker texture, and the generally simple dentation of the margin, and, on the other hand, with its descendant, the *F. ferruginea*, Ait. The *Fagus risdoniana* may therefore justly be considered as the genetic connecting link between the Eocene *F. Wilkinsoni*, and the still existing *F. Moorei*, and, indeed, as the descendant of the former and the ancestor of the latter.

Locality and Horizon.—Risdon, Tasmania; in yellow Travertin of Upper Tertiary age.

Collection.—British Museum (Natural History Branch).

CASTANOPSIS BENTHAMI, *sp. nov.*

Plate II, Fig. 10.

Sp. Char.—C. foliis coriaceis elongato-lanceolatis, integerrimis, basi acutis; nervatione camptodroma; nervo primario valido prominente, recto, apicem versus sensim attenuato; nervis secundariis distinctis, subangulis 70-80° orientibus, numerosis, basem versus abbreviatis et approximatis, marginem versus adscendentibus et attenuatis; nervis tertiariis inconspicuis.

Obs.—A leaf presenting a striking correspondence with leaves of species of *Castanopsis*. The genus named, whose species, with one single exception, inhabit Asia, has mostly coriaceous lanceolate leaves, with approximate, camptodromic secondary veins, ascending towards the margin. It is more especially the leaves of *Castanopsis argentea*, De Cand., var. *Martabanica*, De Cand. (Pl. VII, fig. 8), *C. tribuloides*, De Cand., *C. Tungurrut*, De Cand., and *C. concinna*, De Cand. (Pl. VII, fig. 9), which, in addition to the pecularities named, possess also the marginal characters and form of leaf of the described fossil. In this latter the tertiary veins are wanting. But as in the leaves of *Castanopsis*, especially in those of the analogous species quoted, the tertiary veins and the reticulation are not prominent, the underside being covered with a tomentum, the absence in the unfavourable stone matrix of Dalton of the tertiary veins and the network of the fossil *Castanopsis* leaf is easily explained, and the circumstance may even be regarded as an additional proof of the correct determination of our fossil as a *Castanopsis*. The species approaches the *Castanopsis mephitidioides*, Gey. sp., from the Eocene Flora of Borneo, but differs from it in its less ascending secondary veins.

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[*] This species should be erased from the "Flora Fossilis Artica." The illustrations shown in vol. i, on Pl. VIII, figs. 1-4, and Pl. XLVI, fig. 4; and in vol. vi, Pl. IV, fig 3, of this work, are representations of leaf fossils, which have a somewhat thicker texture, and stronger, prominent, less branched tertiary veins, than the leaves of the species named. These fossils were all derived from the locality of Atanekerdluk above referred to, and belong also probably to forms of the *Quercus grœnlandica*. In the Tertiary Flora of the Arctic Zone occur various beech remains which belong to other species; but amongst them I have failed to discover those of the *Fagus Deucalionis*.

I named this species in honor of Mr. George Bentham, of London, the venerable chief of British botanists, and a great writer on the Flora of Australia.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

SALICINEÆ.

SALIX CORMICKII, *sp. nov.*

Plate II, Figs. 8, 9.

Sp. Char.—S. foliis breviter petiolatis, vix coriaceis, lanceolatis, utrinque angustatis, margine dentatis; nervatione dictyodroma; nervo primario distincto recto, apicem versus valde attenuato; nervis secundariis sub angulis variis plus minusve acutis orientibus, approximatis, inæquilongis, tenuibus, flexuosis, marginem versus adscendentibus; nervis tertiariis inconspicuis.

Obs.—Leaves from the so-called Travertin, near Hobart, showing the greatest similarity with willow leaves. All the characters point to *Salix*, the texture, the form of the leaf, the dentation of the margin, and the venation. The last, shown enlarged in Fig. 8A, must be regarded as dictyodromic*, and corresponds very well with the similarly designated venation of *Salix fragilis*, *S. alba*, *S. purpurea*, and other species of this genus. I have no hesitation, therefore, in referring these leaf fossils, which were collected by Dr. R. MacCormick, Naval Surgeon of the Antarctic Expedition of the vessels "Erebus" and "Terror," to *Salix*. As regards hitherto described European Tertiary plants, our species approaches most closely the *S. varians*, Goepp., which occurs also in the Tertiary Flora of the Arctic Zone. In the North American Tertiary Flora only entire-leaved willows have, so far, been discovered, among which the *S. tabellaris*, Lesq.,† is in some measure analogous to *S. Cormickii*.

Locality and Horizon.—Near Hobart, Tasmania; in yellow Travertin of Upper Tertiary Age.

Collection.—British Museum (Natural History Branch).

MOREÆ.

Genus—FICONIUM.

Gen. Char.—Nervatione camptodroma; nervis secundariis duplicis generis, firmis et tenuissimis, firmis subangulis 45–50° orientibus prominentibus; nervos secundarios tenuissimos plures, includentibus.

Ficonium Solandri, *sp. nov.*

Plate III, Fig. 4.

Sp. Char.—F. foliis coriaceis ovato-lanceolatis, basi acutis, apice acuminatis, margine integerrimis; nervo primario valido prominente recto, excurrente, apicem versus angustato; nervis secundariis firmis marginem versus adscendentibus, attenuatis, infimis abbreviatis laqueos formantibus; nervis secundariis tenuissimis inter se et cum firmis parallelis, simplicibus approximatis; nervis tertiariis inconspicuis.

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* Many years ago the term "*dictyodromic venation*" (netzläufige Nervation), which I have introduced into phyto-palæontological science, was objected to as unsuitable and useless. The objection was grounded on the fact that there are cases in which dictyodromic venation cannot be distinguished from camptodromic venation. Now, I myself was the first to observe that dictyodromic venation merges into the camptodromic. Even the craspedodromic form of venation, to which no exception has been taken, merges into the camptodromic form (*e.g.*, in *Quercus*). These forms of venation are simply links in a series of properties, just as the hexahedron, the octahedron, the rhombic-dodecahedron, &c., are members of the tesseral [or cubic] system of crystals, and may all enter into combination. Yet it does not appear to have occurred to anybody that these terms are of no use in crystallography. I have not deemed it worth my while to take any notice of such trifling objections. But as it appears that lately I have been again accused from the same quarter of introducing useless distinguishing characters into the study of the venation of leaves for phyto-palæontological purposes, I think it advisable to take this opportunity of saving the term dictyodromic ("netzläufig"), which is the one especially objected to, from annihilation. I may add that I use the term with advantage only when the secondary veins of a leaf are gently flexuose from their origin, and in their further course merge into the leaf net. This peculiarity is a very striking one, and a leaf possessing it—for example, the *Zenobia floribunda* (Ettingshausen, Blattskelete der Dicotyledonen, Pl. XXXVIII, figs. 5, 6)—is remarkably different from one with camptodromic venation; for example, the *Forsteronia difformis* (Ettingshausen, *loc. cit.*, Pl. XXVIII, fig. 1). The two examples adduced are of nearly the same form and size.

† L. Lesquereux, "On Species of Fossil Plants from the Tertiary of the State of Mississippi." *Trans. Am. Phil. Soc.*, vol. xiii, p. 414, Pl. XVII, fig. 4.

Obs.—A strong coriaceous leaf, whose thick entire margin appears very prominent in the impression. The form and venation of this leaf reveal at once the characters of a fig-like leaf. In many species of *Ficus* are found, as in the leaf fossil Fig. 4, stronger and weaker almost parallel secondary veins, alternating in such a manner that between every two stronger veins there are two or more finer veins. (Compare Ettingshausen, Blattskelete der Apetalen, *Ficus parasitica*, Pl. XIX, figs. 5, 6; *F. Benjaminea*, Pl. XVII, figs. 3, 4.) On a close examination of the described leaf fossil, however, I hesitate to refer it to the genus *Ficus* itself. The distance between the secondary veins is more unequal, and their originating angles vary more than in *Ficus*. The fossil is especially remarkable for the greatly varying strength of the secondary veins. Whilst in the impression the strong secondary veins are very prominent, the fine intermediate ones are scarcely perceptible without the lens. Fig. 4A shows an enlargement of this venation, taken from a place near the apex of the leaf. The fact of the venation being so different from *Ficus* has induced me to constitute it a separate genus. The species is named after the naturalist, Daniel C. Solander, the companion of Captain Cook.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

ARTOCARPEÆ.

ARTOCARPIDIUM STUARTI, *sp. nov.*

Plate III, Fig. 5.

Sp. Char.—A. foliis magnis, coriaceis, oblongis acuminatis integerrimis; nervatione camptodroma; nervo primario valido prominente, recto, apicem versus attenuato; nervis secundariis subangulis 55–65° orientibus, firmis, inter se remotis, marginem versus adscendentibus attenuatisque; nervis tertiariis e latere externo nervorum secundariorum subangulis acutis, e nervo primario subangulo obtusiore vel recto exeuntibus, tenuibus, simplicibus et ramosis inter se conjunctis; rete macrosynammatum includentibus.

Obs.—A leaf which, if completed, would present a large oblong or lanceolate leaf, resembling in its characters the *Artocarpidium* leaves of the Tertiary Flora of Europe. It approaches the entire margined leaves of *A. integrifolium*, Ung., and *A. bilinicum*, Ett., but is much larger and of a more oblong form. In Fig. 5A the venation is shown enlarged. It resembles that of *Artocarpus rigida* (Ettingshausen, Blattskelete der Apetalen, Pl. XX, figs. 1, 2). That species has similar camptodromic secondary veins, which, however, are more approximate. The fossil should not be confounded with those *Magnolia* leaves which are similar only in size and form, but have a quite different reticulation. I name this species after John MacDouall Stuart, one of the most intrepid and deserving explorers of the interior of Australia, where he perished in the performance of his duty.*

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

LAURINEÆ.

CINNAMOMUM POLYMORPHOIDES, *McCoy.*

Plate III, Fig. 2.

C. polymorphoides, McCoy, in Smyth's Progress Report, Geol. Survey, Vic., 1874, p. 35; *Ibid.*, ii 1875, p. 24.†

Sp. Char.—C. foliis petiolatis coriaceis, oblongis, basi acutiusculis, margine integerrimis; nervatione acrodroma; nervo primario valido, recto, apicem versus attenuato; nervis secundariis paucis, firmis, basilaribus apicem haud attingentibus, margini approximatis, reliquis subangulis 70–80° orientibus, valde arcuatis, inter se remotis; nervis tertiariis inconspicuis.

Obs.—This species resembles in its venation the leaves of *Cinnamomum polymorphum*, A. Braun, but differs as regards the size of the leaf and the almost basally acrodromic and more developed, prominent, strongly-arched, secondary veins. The tertiary veins, which are not preserved in the impression, must have been very fine. The leaf fossil figured, in which the apex is wanting, formed part of the collection named as above.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

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* [Not so. Mr. MacDouall Stuart died in England, June 16th, 1869.—R.E., jnr.]

† [See also McCoy, Prod. Pal. Victoria, 1876, Dec. iv, p. 31, t. 40, f. 1-3.—R.E., jnr.]

CINNAMOMUM LEICHHARDTII, *sp. nov.*

Plate III, Fig. 1.

Sp. Char.—C. foliis coriaceis rigidis oblongis, apice angustatis, margine integerrimis; nervatione acrodroma; nervo primario pervalido, recto apicem versus angustato; nervis secundariis validis, basilaribus apicem attingentibus, reliquis subangulis acutis orientibus, rectis vel paullo arcuatis, inter se remotis, cum basilaribus anastomosantibus; nervis tertiariis distinctis transversis.

Obs.—A leaf belonging, no doubt, to *Cinnamomum;* but not referable to the above described leaf of *C. polymorphoides*, the venation showing several striking differences. The fragment resembles the upper portion of an oblong leaf, whose apex is narrowed. The very prominent margin and the strong principal veins indicate the rigid and coriaceous nature of the leaf. The venation shows on either side a perfectly acrodromic basal vein, which is connected, at least in the upper portion of the leaf, with the other secondary veins. These latter are almost rectilinear, and scarcely reduced in thickness. The tertiary veins are distinctly visible, and transverse. This species reminds one of *Cinnamomum spectabile*, Heer, which has, however, smaller and shorter leaves, with more strongly developed tertiary veins.

Among hitherto known large-leaved forms of tertiary species of *Cinnamomum*, the *C. mississippiense*, Lesq., of the tertiary of North America, and *C. Kanii*, Heer, sp.,* of the Tertiary Flora of the Arctic Zone, may be regarded as related species.

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* The magnificent laurinaceous leaves which were discovered in the Tertiary Strata of Atanekerdluk, in North Greenland, and described and figured as *Daphnogene Kanii* (Flora Fossilis Artica, vol. i, p. 113, Pl. XIV, figs. 1–5, and Pl. XVI, fig. 1), are declared by O. Heer to be distinct from *Cinnamomum*, on account of the petiole being thickened at the point of its insertion in the leaf, and the absence of continuous veinlets in the central principal areas, and finally because of the presence of intermediate lines traversing the principal areas of the leaf.

As regards the petiole, it is found in all *Cinnamomum* leaves with basal principal veins, comparatively thicker than in this instance, as well as in those *Cinnamomum* leaves in which there are usually no basal veins beyond the primary one, and in a few exceptional cases where the lower secondary veins are basal. Compare, for example, the leaf of *Cinnamomum polymorphum* (Heer's Tertiary Flora of Switzerland, vol. ii, Pl. XCIII, fig. 25). A glance at those *Cinnamomum* leaves, in which no basal principal veins occur, except the primary, will be sufficient to convince us that the primary nerve is thickened as far as the origin of the strong lowest secondary veins; indeed, I have often observed a distinct swelling at this point. When the petiole, or primary nerve, sends out stronger veins into the leaf, a considerable weakening must result, leaving the petiole, or primary nerve, proportionately thicker below the dividing point, where again the divergence and production of the basal veins may cause a local swelling of the petiole, or primary nerve. Concerning this swelling of the petiole at its insertion into the leaf, which Heer considers of so much importance, it is only very slight in the leaf of Pl. XIV, fig. 1 (*loc. cit.*), and in the basal portion Pl. XVI, fig. 1, it only appears distinct above the point of insertion. In the basal fragment, Pl. XIV, fig. 2, the petiole occurs just at the line of fracture, and the swelling referred to, supposing the missing portion to be restored, would appear to be also inconsiderable. But this slight swelling of the petiole at the point of departure of stronger basal veins occurs, not only in larger *Cinnamomum* leaves, but also in the leaves of many other species (compare, for example, Ettingshausen, Blattskelete der Apetalen, Pl. I, fig. 1, and Pl. IV, fig. 1), showing plainly that it is caused by the production of diverging basal veins. The cinnamon-like leaves from Atanekerdluk, therefore, as regards the properties of the petiole, present nothing that is uncommon, or on which any generic difference can be founded.

When Heer states (p. 113) in the work quoted that there are *no* continuous veinlets in the central principal areas, he can only mean that the veinlets are generally branching, because *non-branching*, and therefore con-

I dedicate this species in memory of Dr. Leichhardt, the German explorer in Australia, who undertook difficult exploratory journeys in the interior of the Continent, and was with his companions irretrievably lost.

Locality and Horizon.—Dalton, near Gunning, with the preceding.

CINNAMOMUM WOODWARDII, *sp. nov.*

Plate III, Fig. 3.

Sp. Char.—C. foliis rigidis coriaceis ovato-lanceolatis utrinque obtusis, margine integerrimis; nervatione acrodroma; nervo primario firmo, recto; nervis secundariis infimis suprabasilaribus, acrodromis distinctis, subangulis 65-75° orientibus, curvatis, apicem non attingentibus; nervis secundariis reliquis angulo subrecto egredientibus, inter se distantibus, curvatis, marginem adscendentibus; nervis tertiariis solummodo in latere externo nervorum acrodromorum conspicuis, approximatis, curvatis, simplicibus.

A *Cinnamomum* leaf resembling most nearly that of *C. Scheuchzeri*, but differing in the obtuse originating angles of the acrodromic secondary veins. Judging from the strong impression left in the rock by the fossil, the consistence of the leaf must have been remarkably rigid, which is not the case in the species mentioned.

I named this species in honor of my highly esteemed friend, Dr. Henry Woodward, Keeper of the Geological Department of the British Museum, London.

Locality and Horizon.—Shoebridge, near Hobart, Tasmania; Tertiary limestone.

Collection.—British Museum (Natural History Branch).

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tinuous veinlets do undoubtedly occur, as may be seen from the illustrations given by himself (Pl. XIV, figs. 1 and 2, on the upper portion of the leaves; and Pl. XVI, fig. 1, also in the lower portion of a leaf). On the other hand there occur in the central principal areas of *Cinnamomum* leaves, besides continuous veinlets, also branching ones; the latter are especially frequent in *C. camphora* (Ettingshausen, Blattskelete der Apetalen, Pl. XXX, figs. 5–7; Blattskelete der Dicotyledonen, Pl. XVIII, figs. 6–10), and among fossil species in *C. spectabile* (Heer, Tertiärflora der Schweiz, vol. ii, Pl. XCVI, fig. 6). The more or less frequent occurrence of branching veinlets would in this case, however, be insufficient foundation for anything beyond a specific difference, at the utmost.

As regards finally the intermediate lines in the principal areas of the leaf, they are nothing but the adjoining stronger and more prominent anastomosing loops of the veinlets. Similar looping veins are also found traversing the principal areas in cinnamon leaves, although never in the two immediately adjacent to the middle vein, and never in the middle of the areas. In *Cinnamomum zeylanicum* (*vide* Ettingshausen, Blattskelete der Apetalen,, Pl. XXX, fig. 11) the looping veins are quite close to the margin, whilst in *C. camphora* they are more distant from the margin. I am unable to perceive anything beyond a specific difference in this variable occurrence and position of the anastomosing loops at the base of the leaf, and hence I place the abovementioned leaves of Laurineæ from Atanekerdluk under *Cinnamomum*.

CINNAMOMUM HOBARTIANUM, *sp. nov.*

Plate VI, Fig. 2.

Sp. Char.—C. foliis petiolatis coriaceis, ovato-lanceolatis vel lanceolatis (?) basi angustatis, margine integerrimis; nervatione acrodroma; nervo primario basi valido, recto, subito angustato; nervis secundariis infimis suprabasilaribus, acrodromis, distinctis, subangulis 40–50° orientibus, abbreviatis; nervis secundariis reliquis subangulis vix obtusioribus egredientibus, tenuibus, abbreviatis, subrectis, simplicibus; nervis tertiariis in latere externo nervorum acrodromorum prominentibus, remotis curvatis simplicibus, reliquis tenuissimis rete tenerrimum microsynnamatum formantibus.

Obs.—This small fragment of a leaf, which was collected near Hobart by Mr. MacCormick, the surgeon of the ships "Erebus" and "Terror," shows, fortunately, a characteristic portion of the leaf with well preserved venation, which renders its determination quite easy. The fossil belongs to a *Cinnamomum* which differs distinctly from all hitherto described leaves of that genus in its peculiar venation. From a midrib which is very prominent at the base, but soon abruptly contracted, proceed above the base two short acrodromic secondary veins. The other secondary veins, as far as can be ascertained from the fragment, are also comparatively very short and undivided. From the outer sides of the acrodromic secondary veins proceed a few stronger tertiary veins. The others are very fine and short, merging into a minute reticulation, as shown in Fig. 2A, which is an enlargement of this venation.

Locality and Horizon.—Near Hobart, Tasmania; in yellow Travertin of Upper Tertiary age.

Collection.—British Museum (Natural History Branch).

LAURUS AUSTRALIENSIS, *sp. nov.*

Plate IV, Fig. 1.

Sp. Char.—L. foliis rigidis coriaceis, oblongis, basi rotundatis, apice obtusis, margine integerrimis; nervatione camptodroma; nervo primario valido recto excurrente; nervis secundariis subangulis 70–80° orientibus inæquilongis tenuibus, valde arcuatis, furcatis, ramis sæpe inter se conjunctis; nervis tertiariis inconspicuis.

Obs.—This leaf reveals a remarkably rigid texture, and shows an oblong form obtuse at both ends, a prominent entire margin, and a camptodromic venation with proportionately very fine, branching, anastomosing secondary veins, proceeding from a very strong midrib at not very acute angles. The tertiary veins, which probably had been very fine, and merging into a very minute net, are not preserved in the impression. As the fossil, however, in regard to its characters, corresponds best with leaves of existing and fossil Laurineæ, I believe it should be incorporated in that order. And because of its striking similarity with the European tertiary *Laurus Swoszowiciana*, Ung., I refer it to *Laurus* itself. In the North American Tertiary Flora, the *L. socialis*, Lesq., approaches the Australian species. The latter differs from both of the species named, partly in its larger, broader leaves, and partly in its finer, more obtuse-angled, secondary veins. A more detailed comparison with other fossil and living species of *Laurus* would be of no use until more perfect fossils are procured.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

PROTEACEÆ.

LOMATIA PRÆLONGIFOLIA, *sp. nov.*

Plate VI. Fig. 8.

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania, for 1881 [7th Plate], Fig. 16.

Sp. Char.—L. foliis subcoriaceis lanceolatis, acuminatis, remote denticulatis; nervatione brochidodroma; nervo primario firmo, apicem versus valde attenuato; nervis secundariis subangulis acutis variis orientibus adscendentibus, ramosis; nervis tertiariis dictyodromis.

Obs.—This is a mere fragment of a leaf, it is true, but it is easily restored as a lanceolate leaf whose venation is brochidodromic. The margin of the upper portion is remotely denticulate, but most probably entire towards the base. The texture appears to have been rather rigid, or almost coriaceous. This fossil compares best with the leaves of the Australian *Lomatia longifolia*, R. Brown (Ettingshausen, Blattskelete der Apetalen, Pl. XLII. figs. 10–12; Blattskelete der Dicotyledonen, Pl. XXII, fig. 8). The species mentioned has leaves which, as regards form, dentation, texture, and venation, are so similar to it that the identity of the species might be assumed. This is especially the case in respect to those smaller denticulate leaves which are less narrowed towards the apex, one of which is shown nature-printed in Fig. 11 in the work quoted above. The venation only is slightly different; the secondary veins in the fossil leaf are somewhat more remote, and more bent. For these reasons I conclude that the described leaf is the remains of a species of *Lomatia*, which is nearest allied to the *Lomatia longifolia* at present existing in Australia, and, in fact, its ancestor.

The genus *Lomatia* can undoubtedly be traced in the European Tertiary Flora through fruits and leaves. Among described species of that flora the *L. borealis*, Heer, from the Miocene Baltic Flora comes nearest to the above species, but is distinguished by its more approximate secondary veins.

The Tertiary Flora of North America also contains a species of *Lomatia*, which has been erroneously named *Myrica Torreyi* by Lesquereux.* The leaves of this species are very similar to those of the *Lomatia latior*, Heer, of the Baltic Flora, and possess likewise a marginal vein, which does not occur in *Myrica*. The fact that, as Lesquereux states, in the same layer in which his *Myrica Torreyi* occurs, fruits of *Myrica* were also found, is no reason for declaring the *Lomatia* leaves to be *Myrica*, inasmuch as in that layer occur genuine *Myrica* leaves, to which the fruits referred to undoubtedly belong, and in addition also other remains which Lesquereux does not hold to be *Myrica*.

The living *Lomatia longifolia* and the fossil Australian *L. prælongifolia* have not rigid but only subcoriaceous leaves; the American *L. Torreyi*, Lesq., corresponds to both in this respect, but is distinguished by its more numerous secondary veins.

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* Lesquereux, Contributions to the Fossil Flora of the Western Territories. Part II. The Tertiary Flora, p. 129, Pl. XVI, figs. 3–10. The leaves figured have, in general, it is admitted, the form of leaf and dentation of *Myrica*, but at the same time a venation which is unknown in either living or fossil *Myrica* leaves. But as there are a great number of other different plants which have the same form of leaf as the latter, it is difficult to understand why these fossils have been brought under *Myrica* rather than under *Lomatia*, notwithstanding that the venation points by no means to *Myrica*, but directly to *Lomatia*; and notwithstanding also that Lesquereux quite correctly refers to *Lomatia latior*, Heer, with which, even as regards the venation, the leaf fossils in question show so much resemblance, that the identity of the species might be assumed. Lesquereux ascribes a thin membranous texture to the leaves of his *Myrica Torreyi*. On the other hand, the figures published by him show rather a strong or almost coriaceous texture. The midrib of the leaves is strong, their margins very prominent, especially when compared with the representations given by Lesquereux of, for example, delicate portions of the *Sphenopteris nigricans*, *loc. cit.*, Pl. XI, fig. 4; of the leaf of the *Nyssa lanceolata*, *loc. cit.*, Pl. XXXV, fig 5, or of the leaflets of *Sapindus angustifolius*, Pl. XLIX, figs. 2–7. On the other hand, the dentate margin of the coriaceous leaf of the *Dryandroides Cleburni* (*Quercus*, Lesq.), Pl. XX, fig. 2, does not appear more prominent than the margin of the leaf in the drawings of the *Myrica Torreyi*. Hence, I conclude, relying on the well known truthfulness of Lesquereux's drawings, that the consistence of the fossil leaves in question must have been, not membranous, but rather coriaceous. This would render its correspondence with *Lomatia latior*, Heer, which has a coriaceous texture, still more striking, and remove all doubt as to the near affinity, if not identity, of these fossils. The species of *Lomatia* named from the Miocene Baltic Flora, has somewhat smaller leaves, and more approximate, less branching secondary veins than the *L. Torreyi*. On this alone must rest, at present, whatever specific difference there be, until a complete material shall render further elucidation possible, and thus prove conclusively that the Proteaceæ were not wanting even in the North American Tertiary Flora.

Locality and Horizon.—One-tree Point and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

KNIGHTIA DALTONIANA, *sp. nov.*

Plate VI, Fig. 7.

Sp. Char.—K. foliis coriaceis oblongis vel lanceolatis irregulariter dentatis, dentibus obtusiusculis; nervo primario firmo, recto, prominente; nervis secundariis et tertiariis non conspicuis.

Obs.—Notwithstanding that this fossil leaf shows no more than a peculiar irregularly dentate margin, and a prominent straight midrib, together with an oblong form and a coriaceous texture, I will, considering the small number of fossil plants which have as yet been brought to light from the Tertiary of Australia, endeavour, instead of putting it aside, to determine the same. At the first glance, the genus *Knightia* occurred to my mind, and, in fact, I am able to assign several reasons why the specimen should be referred to that genus, which at present is indigenous to New Zealand. Our fossil appears to correspond to a variety of the *Knightia excelsa*, R. Brown, with oblong leaves (compare Ettingshausen, Blattskelete der Apetalen, Pl. XLIII, figs. 2, 3). The unequal obtuse teeth of the margin correspond exactly to those of the leaf quoted, Fig. 2. In *Knightia* the consistence of the leaf is very thick, the secondary and tertiary veins proportionately fine, and the meshes of the net very narrow and delicate, so that the non-preservation of these veins in the fossil *Knightia* would be easily explained.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

DRYANDROIDES JOHNSTONII, *sp. nov.*

Plate IV, Fig. 9.

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania, for 1881 [8th Plate], fig. 29.

Sp. Char.—D. foliis coriaceis elongato-lanceolatis vel lineari-lanceolatis, basem versus sensim angustatis, margine grosse serratis; nervatione craspedodroma; nervo primario valido, prominente recto; nervis secundariis subangulis 75–90° orientibus, tenuibus parallelis, simplicibus subrectis vel paullo arcuatis, valde approximatis, in omni dente 2–3; nervis tertiariis inconspicuis.

Obs.—It cannot be denied that this leaf has great similarity with some fossils from the Tertiary Strata of Central Europe, and incorporated with the Proteacæ. The decidedly prominent margin indicates a coriaceous texture, and an elongate-lanceolate form may be deduced from the fragment at hand. The teeth are rather long, forwardly directed, and without spines. The midrib appears to have been injured in several places, but it is quite evident that it must have been rather strong and prominent. The secondary veins are simple, rectilinear, or very slightly arcuate, approximate, and issuing at nearly right angles; between each pair of secondary veins ending in the points of the teeth, lie two or three scarcely finer parallel veins, which end in the dorsal portion of the tooth. Of the tertiary veins nothing has been preserved, but they were probably very fine, short, and dictyodromic. The characters described, however, are found also, sometimes exactly, and sometimes approximately, in the leaves of existing Proteacæ. The greatest similarity is shown in *Banksia attenuata*, R. Brown (see Ettingshausen, Blattskelete der Apetalen, Pl. XLVI, figs. 1, 3), whose leaves in the dentation of the margin (the teeth being likewise without spines), and the characters of the venation (one character of the secondary veins excepted), agree to a remarkable extent with the fossil. In *Banksia attenuata*, and in most of the other species of *Banksia*, there proceed between every two secondary veins, ending in the points of the teeth, not equal but unequal secondary veins, and, in fact, usually one stronger, and on either side thereof one weaker, alternately. The first of these latter proceeds towards the dental sinus, where it divides into two branches of unequal length; the others are shorter, and become lost in the reticulation of the leaf. This peculiarity of the secondary veins is even more striking in *Banksia æmula*, R. Brown (Ettingshausen, *loc. cit.*, Pl. XLIV, figs. 6–8), *B. serrata*, R. Brown (Ettingshausen, *loc. cit.*, Pl. XLV, figs. 1-5), and others, in which the vein proceeding towards the dental sinus, sends out two branches, which enter the teeth as marginal veins, approximating the margin very closely. In Banksias with lobate leaves, and in most species of *Dryandra*, we find in each lobe several equal or unequal secondary veins converging towards the apex of the lobe, and anastomosing with one another, or at least with the central vein, running into the apex of the lobe. The finer and the outer shorter secondary veins of the lobes are mostly branched. The fossil described, therefore, possesses properties which are shared by *Banksia* and *Dryandra* alike, viz., the coriaceous texture, the strong midrib, and the either rectilinear or slightly arcuate, approximate secondary veins, of which two or three proceed towards each tooth. But at the same time it also shows peculiarities which belong to neither genus, such as the undivided, equally fine, parallel secondary veins, ending partly in the point and partly in the margin of the teeth. It cannot, therefore, be properly referred to either *Banksia* or *Dryandra*, but must be entered under an extinct genus of the past, which embraced both *Banksia* and *Dryandra* as their progenitor, and of which certain forms have since been differentiated into real Banksias and Dryandras. For the present I assume that such progenitor was identical with the proteaceous genus *Dryandroides*, erected by Unger.

An inclusion of the described fossil among the *Myricaceæ* is out of the question, inasmuch as a venation such as has just been portrayed does not occur in that order. Of hitherto known fossil Proteaceæ, the *Dryandroides basaltica*, Ett., from the Fossil Flora of Bilin, and the North American *D. Cleburni*, Lesq., sp.,* are its nearest relatives as regards form, dentation of margin, and venation. The distances between the right-angled secondary veins are also similar, but the intermediate veins are wanting in the two species just named. I dedicated this species to its discoverer, R. M. Johnston, Esq., who has made careful and assiduous researches among the tertiary regions of Tasmania.

Locality and Horizon.—One-tree Point and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

Gamopetalæ.

RUBIACEÆ.

COPROSMA PRÆCUSPIDIFOLIA, *sp. nov.*

Plate V, Fig. 6.

Sp. Char.—C. foliis petiolatis coriaceis, obovatis, basi angustatis apice acuto spinula armatis, margine integerrimis; nervatione camptodroma; nervo primario firmo, subflexuoso, excurrente, apicem versus angustato; nervis secundariis in uno latere 3–4, subangulis 40–50° orientibus, distinctis marginem ascendentibus ramosis; nervis tertiariis vix conspicuis.

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* Lesquereux compares the fossil figured as *Quercus Cleburni* on Plate XX, fig. 2, in the work referred to, with the leaves of *Quercus urophylla*, Ung. These are, however, not narrowed at the base, as the fossil quoted; they have further a very pronounced asymmetry, which in the latter is barely apparent; and finally, they have their secondary veins right-angled on one side only, but on the other side rather acute-angled. In the fossil quoted, on the contrary, the secondary veins issue on both sides of the midrib at almost right angles. Hence the above analogy, and generally the inclusion of the fossil among the oaks, are unfounded. On the other hand, the fossil betrays a much closer affinity with the species of *Dryandroides*. As regards the dentation of the margin and the venation, it resembles the *D. cuneata*, Sap., but as regards the form of the leaf the *D. basaltica*, Ett.

Obs.—This leaf reminds one of the *Cinchonidium* leaves of the Fossil Floras of Sagor and Bilin. As regards its characters, it approximates especially the leaves of *C. mucronatum*, Ett., and *C. coprosmæfolium*, Ett. It is, however, distinguished from both in its thicker coriaceous texture and the smaller number of more acute-angled secondary veins. It has a more prominent spinule, and more distant, more bent, and forwardly ascending secondary veins than the *C. mucronatum*, which it otherwise resembles. It has, further, a shorter petiole, and is more narrowed towards the base than *C. coprosmæfolium*, with which it agrees best as regards the form and size of the leaf, as well as the characters of the secondary veins. Among the North American Tertiary plants, the *Cinchonidium Copeanum*, Lesq., sp.,[*] may be mentioned as approximating the described Australian species.

Among leaves of existing *Rubiaceæ*, I find the leaves of *Coprosma cuspidifolia*, De Cand., from Australia (see Ettingshausen, Blattskelete der Dicotyledonen Pl. XXIV, fig. 8), which are likewise provided with a strong spinule, so closely corresponding to the described fossil in texture, form, and venation, that I have no hesitation whatever in including it under the genus *Coprosma* itself.

Locality and Horizon.—One-tree Point and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

APOCYNACEÆ.

APOCYNOPHYLLUM ETHERIDGEI, *sp. nov.*

Plate VI, Fig. 4.

Sp. Char.—A. foliis submembranaceis, elongato–lanceolatis, apice acuminatis, integerrimis; nervatione brochidodroma; nervo primario prominente, recto, apicem versus attenuato; nervis secundariis numerosis, cum primario angulos 70–80° formantibus, paullo arcuatis, laqueos margine subparallelis; nervis tertiariis angulo recto exeuntibus ramosis, dictyodromis.

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[*] The leaf described by Lesquereux as *Diospyros Copeana*, in the work quoted (p. 232, Pl. XL, fig. 11), has less resemblance to a leaf of *Diospyros* than with leaves of the Cinchonaceæ, especially those of *Cinchonidium bilinicum*, Ett. (Foss. Flora von Bilin, vol. ii, Pl. XXXV, figs. 28–31). As regards the form of leaf and the venation, the leaf referred to agrees perfectly with the leaves of the species named. It only differs in its somewhat stronger texture and the shorter petiole. As a matter of fact, no Cinchonaceæ have as yet been discovered in the Tertiary Flora of North America; yet it appears probable that representatives of the family were included therein, inasmuch as Cinchonaceæ have been traced even in the Tertiary Flora of Europe, and the proper home of the family is at present America.

Obs.—An interesting leaf, which is distinguished from most of the fossils from Dalton, not only as regards its size, but also as regards its much more delicate texture. It shows, perhaps, scarcely half the length of the leaf to which it belongs; the margin is entire, the apex abruptly acuminate. The venation is brochidodromic, and shows a comparatively thin, although upon the whole prominent, straight, and towards the apex gradually tapering midrib. The numerous secondary veins are at almost right angles to the midrib; they are, however, most divergent at the point of insertion, and in their further course slightly arcuate, forming loops; the loops being almost parallel to the margin. The right-angled tertiary veins branch into a loose net. (See the enlargement of the venation, Fig. 4A.)

The characters given agree best with the leaves of various Apocynaceæ, with which, however, the fossil does not correspond sufficiently to be placed under a definite genus of that order. As regards the numerous and almost right-angled secondary veins and their marginal loops, the thinner midribs and the more delicate texture, it agrees best with *Ochrosia* (compare *O. maculata*, Jacq., Ettingshausen, Blattskelete der Dicotyledonen, Pl. XXVII, fig. 6), as regards the tertiary veins with *Alstonia*, and with reference to the peculiar divergent insertion of the secondary veins with species of *Pynopogon*. At present, therefore, I believe that the fossil should be included in the genus *Apocynophyllum*.

Among hitherto described species of that genus, *Apocynophyllum Reinwardtianum*, Goepp., from the Tertiary Flora of Java, comes nearest to our species, but differs in the stronger texture, the strong midrib, and the more prominent marginal loops.

I dedicated the species to my highly esteemed friend, Mr. R. Etheridge, junior, Assistant Curator of the Geological Department of the British Museum, London.*

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rock.

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* [Now Palæontologist to the Department of Mines and the Australian Museum, Sydney.]

APOCYNOPHYLLUM TRAVERTINUM, *sp. nov.*

Plate IV, Fig. 6.

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania, for 1881 [Plate 7], fig. 14.

Sp. Char.—A foliis subcoriaceis, breviter petiolatis, lanceolatis, basi angustatis, margine integerrimis; nervatione camptodroma; nervo primario valido; nervis secundariis distinctis angulo subrecto exeuntibus, paullo curvatis, simplicibus vel furcatis, basem versus approximatis abbreviatisque; nervis tertiariis obsoletis.

Obs.—This fossil, when restored, presents a lanceolate entire leaf, narrowed towards the base, whose venation reveals one of the Apocynaceæ. From the rather strong midrib proceed at almost right angles short camptodromic secondary veins, which towards the margin become more approximate and still shorter. *Alstonia macrophylla*, Wall. (Ettingshausen, Blattskelete der Dicotyledonen, Pl. XXX, fig. 4), from the Philippine Islands, has much larger leaves, it is true, but as regards their form, and the character of the venation, they show a remarkable similarity to the fossil. Among hitherto known species of *Apocynophyllum* from the Tertiary Flora, *A. Reusii*, Ett., of Bilin, and *A. Lesquereuxii*,* of the Tertiary Flora of North America are analogous, but distinguished by their more numerous and more approximate secondary veins.

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* *Apocynophyllum Lesquereuxii*, sp. nov. (*Quercus neriifolia*, Lesq., *loc. cit.*, p. 150, Pl. XIX, fig. 5).

Sp. Char.—Foliis coriaceis, oblongo-lanceolatis integerrimis basis versus angustatis; nervatione camptodroma; nervo primario valido; nervis secundariis subangulo 60° orientibus, tenuibus subrectis parallelis simplicibus, inæqualibus, approximatis; nervis tertiariis inconspicuis.

Obs.—As the Apocynaceæ are one of those families which abound in all tropical floras, as they are not at present wanting in either the American or the European Flora, and, finally, as they can also undoubtedly be traced in the European Tertiary Flora through fruits, seeds, and leaves, it is strange that they should be missing in Lesquereux's meritorious elaboration of the Tertiary Flora of North America. In my opinion the leaf fragments named *Quercus neriifolia* by that Palæontologist (*loc. cit.*, p. 150, Pl. XIX, figs. 4 and 5), should be included under the family named. Moreover, these two remains cannot belong to one and the same species. Fig. 4 shows an ovate apex, fig. 5 a long narrowed base. We would thus have before us in these remains two species of Apocynaceæ from the American Tertiary Flora, of which we will first consider the leaf fossil shown in fig. 5 (*loc. cit.*), whose explanation as an Apocynaceous remains is least doubtful. In its gradual tapering towards the base, it is undoubtedly different from the leaves of *Quercus neriifolia*, A. Braun. The secondary veins are comparatively fine, unequally long, scarcely bent, and do not appear to form any prominent loops. Tertiary veins are not visible. Many Apocynaceæ have also very fine tertiary veins, and a slightly developed reticulation, which could scarcely be preserved in a fossil condition. In the European Tertiary Flora we may regard *Apocynophyllum helveticum*, Heer, as the analogue of *A. Lesquereuxii*. Tertiary strata of Mount Rotonen, New Mexico.

Apocynophyllum Pealii, sp. nov. (*Quercus nereifolia*, Lesq., *loc. cit.*, fig. 4).

Sp. Char.—Foliis coriaceis, lanceolatis integerrimis, basi acutis, nervatione camptodroma, nervo primario firmo, nervis secundariis subangulis 60-65° orientibus distinctus, arcuatis, æqualibus simplicibus vel furcatis, parallelis, basis versus approximatis.

Obs.—Distinguished from the former species in not being narrowed towards the base, and in the more arcuate and only towards the base more approximate secondary veins. Although the form of the leaf does correspond to that of the *Quercus neriifolia*, the variation differs from that of the oak named in the perfectly equal secondary veins, shorter only towards the base. The *Apocynophyllum Hæringianum*, Ett., from the European Tertiary Flora may be regarded as an analogous species. I name the species in honor of its discoverer, Dr. A. C. Peale, one of the State Geologists of the United States of North America. Tertiary strata, near Florissant, Colorado.

APOCYNOPHYLLUM MICROPHYLLUM, *sp. nov.*

Plate IV. Fig. 5.

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [6th Plate], fig. 8.

Sp. Char.—A foliis parvis breviter petiolatis subcoriaceis, ellipticis, utrinque obtusis, margine integerrimis; nervatione camptodroma; nervo primario firmo, recto, excurrente; nervis secundariis distinctis numerosis, approximatis, subangulo recto orientibus, paullo curvatis, simplicibus; nervis tertiariis inconspicuis.

Obs.—A small, apparently almost coriaceous, shortly petiolate leaf, with a venation most frequently met with in the Apocynaceæ, for example, *Carissa*, *Echites*, and others. I therefore think it best to include it also in the collective genus *Apocynophyllum*, until further discoveries shall render a more accurate definition possible. At present I have merely to remark that *Carissa diffusa*, Roxb., from the East Indies, has very similar shortly aculeate leaves.

Locality and Horizon.—One-tree Point, and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

TABERNÆMONTANA PRIMIGENIA, *sp. nov.*

Plate IV. Fig. 3.

Sp. Char.—L. foliis petiolatis subcoriaceis, lanceolatis basi angustatis apice acuminatis, margine integerrimis; nervatione camptodroma; nervo primario distincto, recto, basi prominente, apicem versus attenuato, excurrente; nervis secundariis in uno latere 11–12, subangulis 75–85° orientibus, arcuatis, parallelis, simplicibus; nervis tertiariis tenuibus, latere externo angulis acutis egredientibus, abbreviatis.

With the two above described species I would range a representative of *Apocynophyllum* in the Flora of the Arctic Zone, viz.:

Apocynophyllum Heeri, sp. nov. (*Salix* [illegible], Heer. Flora Foss. Arct. III. Nr. 3. Pl. IV. figs. 7–10.

Sp. Char.—Foliis breviter petiolatis lanceolatis, utrinque acuminatis, integerrimis, nervatione camptodroma, nervo primario valido, nervis secundariis tenuibus angulis acutis egredientibus, inter se conjunctis, nervis tertiariis inconspicuis.

Obs.—The leaf [illegible] figured in the work quoted agree better with Apocynaceæ than with Salix. The species with which Heer united it, S. [illegible], A. Braun, has linear-lanceolate leaves, narrowed much less towards the base than towards the apex, whose midrib, in proportion to the secondary veins, is not nearly so thick as in the leaves quoted from Puilasok in Greenland, which taper equally towards both ends. These leaves must, therefore, belong to some other plant. Such lanceolate leaves, tapering equally towards both ends, with a short thick petiole, and more or less prominent broad midrib, are met with in many Apocynaceæ, as, for example, [illegible], Lam., [illegible] and [illegible], De Cand., [illegible], [illegible], Vahl., *Amsonia salicifolia*, Pursh, *Balfouria saligna*, R. Brown, [illegible], [illegible], and others. For the present I include it in the collective genus *Apocynophyllum*, and dedicate it to the distinguished explorer of the Fossil Flora of the Arctic, Professor O. Heer. Upper Tertiary strata of Puilasok, Greenland.

Obs.—The leaf fossil, Fig. 3, has the character of Apocynaceous leaves, namely, of species of *Tabernæmontana*, *Aspidosperma*, *Allamanda*, &c. It shows a somewhat coriaceous texture, a lanceolate, entire form, narrowed at both ends, a short petiole, and a camptodromic venation. The midrib is very prominent only at the base, and sends forth on either side at slightly acute angles several simple secondary veins, which towards the margin are bent slightly forward, equi-distant, and gradually shortened towards both ends. The tertiary veins have been preserved in one place only, are very fine, and issuing from the outer side at acute angles. No reticulation can be seen.

The characters mentioned are met with almost entirely in the leaves of species of *Tabernæmontana* (see Ettingshausen, Blattskelete der Dicotyledonen, Plate XXIX, figs. 1, 4 and 8). Those leaves show also a slightly developed fine reticulation, which in a fossil condition might easily disappear. It is therefore extremely probable that the fossil from Dalton, just described, belongs to *Tabernæmontana*.

As an analogous and representative species from the European Tertiary Flora we may regard *Tabernæmontana bohemia*, Ett., from the Fossil Flora of Bilin. As an analogous species in the present flora, I regard the *T. laurifolia*, L., from Jamaica.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

ECHITONIUM OBSCURUM, *sp. nov.*

Plate IV, Fig. 10.

Sp. Char.—E. foliis ovatis (?) coriaceis, integerrimis; nervatione brochidodroma; nervo primario valido, recto excurrente; nervis secundariis prominentibus subangulis 75–85° orientibus, valde arcuatis, laqueos margini approximatis; nervis tertiariis haud conspicuis.

Obs.—In the Miocene strata of Radoboj and Leoben there occur seeds which are characterised by a long tuft of hairs. They belong to the Apocynaceæ, and have been referred by Unger to the fossil genus *Echitonium*. Together with these seeds in the strata of Leoben I found leaves, which have the habit of Apocynaceous leaves, and must belong to the seeds in question. These leaves are coriaceous, ovate or broadly elliptical, entire, and distinguished by a brochidodromic venation, with few very prominent and rather distant secondary veins. The loops are very apparent. The tertiary veins are mostly not preserved. I find that the leaf fossil here figured, which was collected by Mr. MacCormick near Hobart, as regards its form (*i.e.*, as far as it can be restored), as well as in the venation and texture, shows a striking resemblance to the leaves of *Echitonium macrospermum*, Ett., from Leoben*. The leaf from Hobart, however, ought to have had a somewhat larger number of secondary veins, which are also more approximate than in the leaves from Leoben. In this respect it approaches my *E. lanceolatum.* This leaf fossil from Hobart, therefore, would seem to indicate a peculiar species of *Echitonium,* the further elucidation of which must depend upon future research and more complete specimens.

Locality and Horizon.—Near Hobart, Tasmania; in yellow Travertin of Upper Tertiary age.

Collection.—British Museum (Natural History Branch).

BORAGINEÆ.

CORDIA TASMANICA, *sp. nov.*

Plate V, Figs. 3–5.

Sp. Char.—C. fructibus drupaceis, putamine oviforme acuto, irregulariter scrobiculato, quadriloculare; foliis rigide coriaceis scabris, ovatis vel ellipticis, rotundato-obtusis, integerrimis; nervatione camptodroma; nervo primario valido apicem versus attenuato; nervis secundariis prominentibus,

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*An Apocynaceous species from the Arctic Tertiary Flora, which approaches the *Echitonium macrospermum* very closely is:—

Echitonium lanceolatum, *sp. nov.* (*Laurus Reussii*, Heer, *loc. cit.*, vol. vi, p. 2, Pl. III, fig. 14).

Sp. Char.—Foliis breviter petiolatis coriaceis lanceolatis, basi acutiusculis, margine undulatis; nervatione, brochidodroma; nervo primario firmo; nervis secundariis sparsis distinctis, subangulis 50-60° egredientibus, segmentis subæqualibus, arcubus laqueorum prominentibus, margini subparallelis; nervis tertiariis inconspicuis.

Obs.—The leaf fossil from Atanekerdluk quoted certainly agrees in form with the leaves of *Laurus Reussii*, Ett. (Bilin, II, Pl. XXXI, figs. 5 and 11), but has on either side only 7-8 secondary veins, which form similar segments, and whose arched loops are equi-distant from the margin, and almost parallel to it. In *Laurus Reussii* there are on each side 11 12 secondary veins, forming dissimilar segments; the arched loops are at unequal distances from the margin, and for the most part not parallel to it; and finally there are basal acute angled secondary veins, which are wanting in the leaf from Atanekerdluk. These fossils, therefore, cannot possibly belong to one another. On the other hand, the leaf fossil quoted shows in these very particulars such a great similarity to the leaf of *Echitonium macrospermum*, Ett., from the Fossil Flora of Leoben (see Contributions to that Flora, Sitzungsberichte, vol. lx, Pl. IV, fig 3) that one might be tempted to regard the remains as identical. The leaf from Atanekerdluk is more narrow, however, and the arched loops are close to the margin, whilst in the leaf from Leoben they are remarkably distant. An Apocynaceous seed (fig. 4, *loc. cit.*) was found together with the leaf in the strata of Leoben, which has served as an important factor in the identification of the remains. I therefore believe that the leaf from Atanekerdluk should be included in the collective genus *Echitonium*, in which similar leaf fossils have been collocated.

subangulis 50–60° orientibus, arcuatis, inter se distantibus parallelisque, marginem versus adscendentibus et haud laqueos formantibus, in rete dissolutis; nervis tertiariis distinctis e latere externo nervorum secundariorum angulo acuto egredientibus, fere transversim conjunctis; rete tenerrimo vix conspicuo includentibus.

Obs.—A remarkable fossil fruit, discovered by Mr. R. M. Johnston in the Derwent district of Tasmania, of which Fig. 4 shows a longitudinal view, and Fig. 5 a view of the base. It is an acutely oviform quadrilocular putamen, the surface of which is irregularly covered with numerous small depressions and intervening tubercles, and resembling more especially the quadrilocular fruit stones of *Cordia.*

The fossil leaf, Pl. V, fig. 3, from Risdon, is so imperfectly preserved, it is true, that its form can only be guessed at, yet it shows some very peculiar characteristics by means of which the determination of the genus becomes more than approximate. The fragment is capable of being restored into a broad, obtuse, ovate or elliptical leaf. The thick margin indicates a remarkably stiff texture. The surface is distinctly covered with close and very small protuberances (see the enlargement of the venation Fig. 3A). The midrib and the camptodromic secondary veins are very prominent. The latter are not approximate, and proceed a short distance up the margin, where they merge into the leaf net. The tertiary veins are connected, and almost transverse; the reticulation is very fine, but, owing to the protuberances, not distinctly visible.

The characters enumerated point to the genus *Cordia,* in which are found species with very similar leaves, for example *C. Bossieri,* De Cand., *C. subopposita,* De Cand., *C. senegalensis,* Juss., *C. dioica,* Boj., *C. Perrottetii,* De Cand., and others.

From these facts the occurrence of the genus *Cordia* in the Tertiary Flora of Tasmania can scarcely be subject to doubt. In the present flora of this part of Australia the genus *Cordia* is not to be found, although a few species are met with in tropical Australia, having emigrated thither from the Monsoon regions of India.

Locality and Horizon.—Estuary of the River Derwent, Tasmania—Risdon, Tasmania.

Collection.—(?) R. M. Johnston.

VERBENACEÆ.

PREMNA DRUMMONDII, *sp. nov.*

Plate VI, Fig. 6.

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [6th Plate], fig. 2, and [8th Plate], figs. 25 and 26.

Sp. Char.—P. foliis coriaceis ovato-rotundis, integerrimis; nevatione camptodroma; nervo primario valido, subflexuoso; nervis secundariis prominentibus, subangulis 80–90° orientibus, arcuatis flexuosis, marginem versus ramosis; nervis tertiariis angulo subrecto egredientibus tenuibus flexuosis.

Obs.—Rounded, coriaceous, entire leaves, with camptodromic venation. The midrib is very prominent, and somewhat flexuose. The secondary veins are strong, somewhat flexuose, and issuing at nearly right angles, the tertiary veins at slightly acute and right angles. The leaves are remarkably similar to those of the Australian *Premna obtusifolia*, R. Brown (Ettingshausen, Blattskelete der Dicotyledonen, Pl. XXXI, fig. 8); but the latter appear to have more branched and connected tertiary veins than the fossil.

I named the species after the deserving botanist, Drummond, who made extensive travels in Australia for the purpose of exploring its flora.

Locality and Horizon.—One-tree Point and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary beds.

SAPOTACEÆ.

SAPOTACITES OLIGONEURIS, *sp. nov.*

Plate IV, Figs. 11, 12.

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [6th Plate], fig. 1, and [8th Plate], fig. 30.

Sp. Char.—S. foliis rigide coriaceis, obovatis, emarginatis integerrimis; nervatione camptodroma; nervo primaris valido, excurrente; nervis secundariis paucis distinctis, subangulis acutis variis orientibus, simplicibus vel furcatis; nervis tertiariis inconspicuis.

Obs.—These leaf remains reveal their affinity to species of *Sapotacites* undoubtedly, and especially to the *S. minor*, from the tertiary strata of Europe. The above-described species differs from the latter only in its less numerous secondary veins, which are somewhat more prominent, whilst the other characters, namely, the deep indentation of the rounded obtuse apex, and the stiff leathery texture, are common to both.

Locality and Horizon.—With the preceding species.

Collection.—R. M. Johnston.

SAPOTACITES ACHRASOIDES, *sp. nov.*

Plate V, Fig. 9.

Sp. Char.—S. foliis breviter petiolatis, coriaceis, ovatis, apice acutis, basi productis, margine integerrimis; nervatione dictyodroma; nervo primario firmo, recto, excurrente; nervis secundariis tenuibus, subangulis 70–80° orientibus, ramosis, approximatis; nervis tertiariis tenuissimis.

Obs.—The form, texture, and venation of this leaf bespeak one of the Sapotaceæ. In this family we find in *Achras* much similarity of leaf, on the one hand in the living *Achras Sapota,* and on the other hand in the fossil *A. lycobroma.* But similar leaves occur also in *Sideroxylon,* and in a few others, so that a more exact determination of the fossil Sapotaceæ must be left for future researches. In the meantime the leaf from the Derwent strata may be referred to *Sapotacites.*

As vicarious species, we may regard the *S. solidus,* Heer, sp.,[*] in the Tertiary Flora of the Arctic Zone, and the *S. Copeanus,* Ett.,[†] in the North American Tertiary Flora.

Locality and Horizon.—With the preceding species.

Collection.—(?) R. M. Johnston.

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[*] SAPOTACITES SOLIDUS (*Myrica solida,* Heer, *loc. cit.,* vol. v, No. 3, p. 28, Pl. V, figs. 2, 3.)

Obs.—The remarkably stiff and coriaceous texture of the leaf quoted from Sachalin, the extremely delicate approximate secondary veins, which proceed from a strong midrib, and branch at times towards the margin, and finally the almost parallel margins and the obtuse base decidedly indicate one of the Sapotaceæ. Among described fossil species it approaches, as regards form and texture, most nearly *Sapotacites angustifolius,* Ettingshausen, from Bilin; in the latter, however, the secondary veins are not preserved, probably on account of their delicate nature. Among living plants we find similar leaves in species of *Mimusops, Bassia, Achras,* in *Chrysophyllum pauciflorum* and *O. angustifolium,* and several others.

[†] SAPOTACITES COPEANUS, sp. nov. (*Sapindus coriaceus,* Lesq., *loc. cit.,* Pl. XLIV, fig. 13.)

Sp. Char.—Foliis breviter petiolatis rigide coriaceis, oblongo-lanceolatis integerrimis, margine reflexis, nervatione camptodroma, nervo primario valido, nervis secundariis tenuissimis, vix conspicuis.

Obs.—Among hitherto described fossil species of North America none of the Sapotaceæ are to be found. It is highly probable, however, that the family, which is at present so strongly represented in America, was not wanting in the North American Tertiary Flora. The remains may not as yet have been detected in the Tertiary strata of North America, or perhaps they have been overlooked or confounded with other fossils. Among the plant fossils described and figured by Lesquereux, in the work above quoted, I believe I can recognise a member of the Sapotaceæ in the leaf fossil defined as *Sapindus coriaceus.* Such a stiff leathery leaf with reflexed margin occurs neither in living nor in hitherto published fossil Sapindaceæ; on the other hand, very similar leaves are found in the Sapotaceæ, for example, in *Bumelia* and *Chrysophyllum.* The very unimportant asymmetry which is observed in the leaf fossil quoted, may be a casually abnormal form, especially as such an unequal development of the sides of the leaves is not rare in Sapotaceæ, and more particularly in the genus named (compare

Dialypetalæ.

SAXIFRAGACEÆ

CERATOPETALUM WOODII, *sp. nov.*

Plate V, Fig. 1.

Sp. Char.—C. foliis ternatis (?) foliolis petiolatis coriaceis lanceolatis, serratis; nervatione camptodroma; nervo primario firmo excurrente, recto; nervis secundariis sub angulis 40–50° orientibus, tenuibus, flexuosis, ramosis, approximatis, nervis tertiariis inconspicuis.

Obs.—The fossil represented in Fig. 1 agrees in every particular with the ternate leaf of a species of *Ceratopetalum;* the larger leaf fossil with the terminal leaflet, and the smaller with a lateral leaflet. The two leaves lie so close to one another, that from this alone it might be inferred that they are the component leaflets of a compound leaf. The common petiole, to which the leaflets must have been attached by their rather long petiolules, has been lost subsequently to the detachment of the leaflets. In the leaves of existing species of *Ceratopetalum*, the leaflets have only very short petiolules. The species described corresponds to *C. bilinicum*, Ett., to such an extent that I am almost inclined to regard these fossil plants as identical. The only difference is that *C. Woodii* has somewhat larger leaves and longer petiolules. *Ceratopetalum americanum*, Ett.,* is an analogous species in the North American Tertiary Flora.

I named this species in honor of Harrie Wood, Esq.,† who has done much for the promotion of geological science in Tasmania.‡

Locality and Horizon.—Risdon, Tasmania; in yellow Travertin of Upper Tertiary age.

Collection.—British Museum (Natural History Branch).

Chrysophyllum monopyrenum, Ettingshausen. Blattskelete des Dicotyledonen, Pl. XXXIX, fig. 10). It is different with the leaf fossil called *Sapindus coriaceus* in the work quoted, Fig. 14. It does not betray any remarkably strong texture, nor does it show a recurved margin, but certainly a very decided asymmetry at the base. This fossil belongs to quite a different plant than that represented in Fig. 13, which may be allowed to retain the designation *Sapindus coriaceus*.

I dedicated this new Sapotacean, of which the *Sapotacites lanceolatus*, Ett., is the analogue in the European Tertiary Flora, to its discoverer Professor E. D. Cope.

Tertiary strata at Elko Station, Nevada.

* *Ceratopetalum americanum*, sp. nov. (*Myrica acuminata*, Lesq., *loc. cit.*, Pl. XVII, figs. 1-4).

Obs.—These leaves are mostly similar to those of *Ceratopetalum haeringianum*, Ett., from which they differ only in the somewhat more acuminate marginal teeth. *Myrica acuminata*, Ung., to which the fossils in question have been referred by Lesquereux, have longer acuminate leaves, broader below the middle, and a different venation (compare Heer, Tertiärflora der Schweiz, vol. ii, Pl. XXIX, fig. 20). *Myrica Zachariensis*, Sap., and *M. [illegible]*, Heer, sp., with which the fossil under consideration has also been compared, belong to different genera, the first likewise to *Ceratopetalum*, but the latter to *Carya*.

† [Under-Secretary for Mines, Sydney.—R. E. jnr.]

‡ [The Baron probably means the word "Tasmania" to read "Australia."—R. E., jnr.]

CERATOPETALUM PRÆARBUTOIDES, *sp. nov.*

Plate V, Fig. 2.

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [9th Plate], fig. 35.

Sp. Char.—C. foliis ternatis (?), foliolis coriaceis oblongis vel lanceolatis, grosse serratis; nervatione camptodroma; nervo primario firmo recto; nervis secundariis subangulis 55–65° orientibus, distinctis, flexuosis ramosis; nervis tertiariis inconspicuis.

Obs.—The unequal base shown by the fossil, Fig. 9, is indicative of a leaflet. Its similarity with the leaflets of the previous species and of *Ceratopetalum bilinicum*, on the one hand, and with the leaflets of the still existing *C. arbutifolium*, on the other hand, renders it probable that it also belongs to the genus *Ceratopetalum*. The described fossil differs from the leaflets of the two first-named species in its more prominent and more roughly serrated margin, and in its more obtuse-angled secondary veins. Hence the independence of the *C. præarbutoides* with reference to the fossil species quoted must be assumed. As regards the still existing species, all the characters present are so similar that the species might be considered as identical. More complete specimens must be found, however, before this point can be decided.

Locality and Horizon.—One-tree Point, Pipeclay Bluff, &c., Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

MAGNOLIACEÆ.

MAGNOLIA BROWNII, *sp. nov.*

Plate V, Fig. 7.

Sp. Char.—M. foliis coriaceis obovato-oblongis, integerrimis; nervatione camptodroma; nervo primario valido, recto, apicem versus angustato; nervis secundariis subangulis 55–65° orientibus, curvatis subflexuosis, inæqualiter inter se distantibus; nervis tertiariis tenuibus, latere externo angulis acutis egredientibus; rete inconspicuo.

Obs.—A leaf fossil, whose form can be easily restored, and which, together with the texture and venation, points to *Magnolia*. Among the species of that genus whose occurrence in the Tertiary Flora has been proved by means of fruit receptacles and leaves, the ***M. Dianæ***, Ung., from the Fossil Flora of Radoboj, comes very close to our species. The ***M. tenuinervis***, Lesq., from the North American Tertiary Flora, also resembles it as regards the venation, but differs in not having its form of leaf narrowed towards the base. The likewise similar ***M. Inglefieldi***, Heer, from the Arctic Tertiary Flora is distinguished by its more distant and generally more acute-anglèd tertiary veins.

I dedicated this species in memory of Robert Brown, the earliest investigator of the Flora of Australia.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

MAGNOLIA TORRESII, *sp. nov.*

Plate V, Fig. 8.

Sp. Char.—M. foliis coriaceis ovato-oblongis, integerrimis; nervatione camptodroma; nervo primario pervalido, recto, apicem versus angustato; nervis secundariis firmis, subangulis 55–65° orientibus, leviter curvatis, æqualiter inter se distantibus parallelisque, nervis tertiariis inconspicuis.

Obs.—Differs distinctly from the previous species in its larger, more ovate leaves, stronger, slightly curved, but not flexuose secondary veins, placed at equal distances, and parallel to one another. As in the former species, the consistence of the leaf is strongly coriaceous, and the reticulation not preserved. As regards the leaves, ***Magnolia Lesleyana***, Lesq., and ***M. regalis***, Heer, are very similar to this species. Future research, aided by more complete materials, may perhaps disclose the nearer mutual relations of these species to one another.

I named this species after the Spaniard, de Torres, one of the earliest [maritime] discoverers of Australia in the seventeenth century.

Locality and Horizon.—With the preceding species.

STERCULIACEÆ.

BOMBAX STURTII, *sp. nov.*

Plate VI, Fig. 1.

Sp. Char.—B. foliis submembranaceis obovato-lanceolatis; in petiolum brevissimum attenuatis, apice acutis, margine integerrimis nervatione camptodroma; nervo primario basi prominente, apicem versus attenuato, recto; nervis secundariis subangulis 50–60° orientibus, distinctis arcuatis, marginem adscendentibus, basem versus abbreviatis; nervis tertiariis angulo subrecto egredientibus simplicibus vel ramosis flexuosis inter se conjunctis.

Obs.—This well-preserved leaf has, on account of the somewhat asymmetrical development, the habit of a leaflet, and, as regards its form and venation, agrees best with the leaflets of *Bombax.* These are very deciduous, mostly very shortly petiolate, obovate-lanceolate, entire margined, and have besides in several species a delicate almost membranous texture, as well as a camptodromic venation, for example, the *Bombax grandiflorum*, Cav. and A. (compare Ettingshausen, Nervation der Bombaceen, Denksch. K. Akad. Wissensch. Wien, vol. xiv, Pl. II, figs. 2 and 4). With a species of *Bombax* from Guatemala (compare Ettingshausen *loc. cit.*, Pl. II, fig. 3), our species shares the acute-angled camptodromic secondary veins, gradually shortened towards the base, and the very short petiole; with *B. floribundum* (Ettingshausen, *loc. cit.*, Pl. V, fig. 1; Pl. VI, fig. 7) the obovate-lanceolate form, the strongly contracted base, and the obtuse-angled or right-angled tertiary veins, and finally with several other species the shortly acuminate apex of the leaflets (compare *loc. cit.*, Pl. IV, figs. 3–5; Pl. V, figs. 4–6).

I therefore believe I cannot be wrong in regarding the described leaf as the remains of a species of *Bombax*, and I name it after Captain Sturt, an Englishman, who made important exploratory journeys in the interior of Australia.

Locality and Horizon.—With the preceding species.

BOMBAX MITCHELLI, *sp. nov.*

Plate VI, Fig. 2.

Sp. Char.—B. foliolis coriaceis obovatis integerrimis basi attenuatis; nervatione camptodroma; nervo primario valido prominente, recto; nervis secundariis subangulis 50–60° orientibus, prominentibus, inæqualibus remotis, valde arcuatis marginem adscendentibus, basem versus abbreviatis; nervis tertiariis latere externo subangulis acutis egredientibus, flexuosis inter se conjunctis subtransversis.

Obs.—This is also a leaflet of *Bombax*, approaching the last described in many respects, but differing in a more rigid texture, the more obovate form, the more distant, more prominent, and very unequal secondary veins, and the most acute-angled tertiary veins. It must therefore be incorporated with a particular species, corresponding very well to still existing species of *Bombax*, with large and broad leaflets (compare Ettingshausen *loc. cit.*, Pl. II, fig. 2; Pl. V, fig. 7). From this the *Bombax oblongifolium*, Ett., from the Fossil Flora of Bilin, is distinguished only by more approximate loop-forming secondary veins, and shorter tertiary veins.

The species is named after Sir Thomas Mitchell, who has done much for the promotion of Australian Geography.

Locality and Horizon.—With the preceding species.

SAPINDACEÆ.

SAPINDUS TASMANICUS, *sp. nov.*

Plate VI, Fig. 8.

Sp. Char.—S. foliolis coriaceis inæquilateris, ovato-lanceolatis, acuminatis, integerrimis; nervatione camptodroma; nervo primario firmo prominente; nervis secundariis distinctis, subangulis 55–65° orientibus, arcuatis simplicibus vel furcatis marginem adscendentibus, infimis angulis acutioribus egredientibus; nervis tertiariis haud conspicuis.

Obs.—A leaflet, whose asymmetric outline reminds one of the leaflets of both Sapindaceæ and *Ailanthus*. Even the venation would not, as respects the small number of secondary veins, be incompatible with the latter genus.

But there are also present basal acute-angled secondary veins, which are not found in *Ailanthus*. Such are, however, found in *Sapindus*, for example, *S. esculentus*, St. Hil. In *S. falcifolius*, A. Braun, the lowest secondary veins also issue, at least on one side, at more acute angles than the others. The only character inconsistent with *Sapindus*, in the present instance, is the small number of secondary veins. In this respect the fossil would agree better with other Sapindaceæ, *e. g.*, *Schmidelia* and *Serjania*; but taking into consideration the form and the other characters of the venation, it does not at all correspond to those genera, but best to *Sapindus*. In the North American Tertiary Flora we find a species, the *S. caudatus*, Lesq., whose leaflets resemble the form and acuminate apex of our fossil; also a second species, the *S. obtusifolius*, Lesq., which corresponds to it in the number of secondary veins. In both species, however, the acute-angled lowest secondary veins are wanting. The *Sapindus defunctus*, Heer, from the Fossil Flora of Sachalin, can also be regarded as an analogous species of the *S. Tasmanicus*. In the former, as in the latter, the secondary veins ascend abruptly towards the margin.

The genus *Sapindus* is wanting in the present flora of Tasmania. In Queensland, however, it is represented by several endemic species.

Locality and Horizon.—Estuary of the River Derwent, Tasmania.

Collection.— (?).

TILIACEÆ.

ELÆOCARPUS BASSII, *sp. nov.*[*]

Plate VI, Figs. 9–12.

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania for 1881 [10th Plate], fig. 57, and [11th Plate], fig. 60.

Sp. Char.—E. fructibus drupaceis, putamine ovali irregulariter tuberculato, rimoso, quinqueloculari (?).

Obs.—Plate VI, fig. 11 on account of its peculiarities of surface, is a well characterised fossil fruit, whose flatness must not in any way be regarded as a character of the fruit, but has resulted from external compression. The irregular, closely-packed furrows, limited by injured ribs, are found on the surface of the putamen of *Elæocarpus*, precisely as in the described fossil. Figs. 9 and 10 are merely a fragment of the putamen, which, as Fig. 12 shows, consisted of five pieces, similar to that of *Elæocarpus Albrechti*, Heer, from the Fossil Flora of the Sam country (compare Heer, *loc. cit.*, Plate X, figs. 1–4), which one fossil resembles also in its form. However, the putamen of the species named is distinguished by more prominent longitudinal ribs. In its more irregular furrows and ribs, the putamen of the *Elæocarpus Bassii* resembles very closely that of some still existing species, for example, *E. (Ganitrus) sphæricus* (compare Gaertner,

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[*] [In the explanation of the figures attached to his paper, Mr. Johnston cites fig. 60 (here referred to by Baron von Ettingshausen), under the name of *Rhytidotheca Johnstonii*, F. v M., *nov. sp.* As a comprehensive figure, even without description, is held sufficient to establish an author's right to his species, it appears to me that Sir F. von Mueller's specific name should take precedence of Ettingshausen's, more particularly when the figure in question was clearly good enough to enable the latter observer to use it in the sense indicated.—R.E., jnr.]

De Fructibus et Seminibus Plant. vol. ii, Pl. CXXXIX), which likewise consists of five pieces, and only differs from the first in its more globose form.

I named this species after the English naval surgeon, Bass, one of the earliest explorers of Tasmania towards the end of the last century.*

Locality and Horizon.—Beaconsfield, Tasmania; auriferous Deep Lead, of Upper Tertiary age.

Collection.—R. M. Johnston.

PITTOSPOREÆ.

PITTOSPORUM PRISCUM, *sp. nov.*

Plate VI, Fig. 3.

Sp. Char.—P. foliis coriaceis oblongis obtusis integerrimis; nervatione dictyodroma; nervo primario prominente recto, apicem versus valde attenuato vel evanescente; nervis secundariis in æqualibus approximatis tenuissimis subangulis 55-65° orientibus, flexuosis ramosis; nervis tertiariis latere externo subangulis acutis egredientibus, ramosis, in rete tenerrimum dissolutis.

Obs.—The fragment at hand, Fig. 3, can be restored into an oblong entire-margined leaf. The apex is roundedly obtuse, the texture apparently tough. These peculiarities, and the character of the well-preserved venation, Fig. 3A, point to a species of *Pittosporum.* Among living species of this principally Australian genus, the *P. Tobira,* Ait. (Ettingshausen, Blattskelete der Dicotyledonen, p. 149, fig. 125), a Japanese species, is in every respect most analogous. Of hitherto described fossil remains of *Pittosporum,* those from Parschlug, designated as *Pittosporum cuneifolium,* Unger (see Sylloge Plant. Foss., vol. ii, p. 6, Pl. I, figs. 14, 15), and corresponding to the Australian species as regards form and texture of leaves, appear to belong to a very similar species; but no definite conclusion can be arrived at until better specimens are obtained of these leaves, of which at present we know in its entirety only the venation.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

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* [Rather an explorer of the seas and coasts of Australia and Tasmania.—R.E., jnr.]

CELASTRINEÆ.

CELASTROPHYLLUM CUNNINGHAMI, *sp. nov.*

Plate VI, Fig. 5.

Sp. Char.—C. foliis submembranaceis, ovalis (?) dentatis; nervatione camptodroma; nervo primario distincto recto, secundariis approximatis, subangulis 60–65° orientibus, tenuibus simplicibus vel furcatis; nervis tertiariis angulis acutis, egredientibus, tenuissimis dictyodromis.

Obs.—This fossil is too imperfectly preserved to admit of a definite determination of its form. But from the contraction of the area of the leaf at the lower end, we may suppose that it was ovate at the base. It also appears that the apex could not have been far distant from the line of fracture at the upper end, so that the form of the leaf must have been ovate or elliptical, rather than oblong or lanceolate. The margin is distinctly visible in one place only, and shows small approximate teeth, which have not left shallow impressions at either their sinuses or their apices. This circumstance, as well as the feeble midrib, indicates a more delicate texture. The characters adduced and the venation, of which Fig. 5A is an enlargement, point to the order of Celastrineæ, in which similar small dentate leaves often occur, as, for example, in *Maytenus Boaria* (Ettingshausen, Nervation der Celastrineen, Densch. K. Akad. Wissensch. Wien, vol. xiii, Pl. IV, figs. 4–6), *Evonymus americanus* (Ettingshausen, *loc. cit*, Pl. VIII, figs. 6, 7), and several others.

The Celastrineæ are abundantly represented in the Tertiary Flora of Europe, and among them the *Evonymus Latoniæ*, Ung., the *Celastrus oxyphyllus*, Ung., and the *C. Æoli*, Ett., approach the Australian Celastrineæ in some respects, although their leaves have a stronger texture. As the genus to which the described fossil belongs cannot at present be ascertained, and may possibly have become extinct, I have preferred to place it in the collective genus *Celastrophyllum.*

I named the species after the English botanist, Allan Cunningham, who, fifty years ago, made important exploratory journeys towards the interior of Australia.

Locality and Horizon.—With the preceding species.

RHAMNEÆ.

POMADERRITES BANKSII, *sp. nov.*

Plate VI, Fig. 4.

Sp. Char.—P. foliis membranaceis, lanceolatis, basi ovata obtusiusculus, apicem versus angustatis, margine integerrimis; nervatione camptodroma; nervo primario debili, recto, apicem versus attenuato; nervis secundariis tenuibus, subangulis 30–40° orientibus, marginem adscentibus, simplicibus, basilaribus oppositis, religuis alternis; nervis tertiariis tenuissimis approximatis, transversis.

Obs.—A leaf with well-preserved venation, and so distinguished by several well-marked characters, that there is no difficulty in determining at least the family to which it belongs. It reveals a delicate membranous texture, has a lanceolate form, ovate at the base, and gradually narrowed towards the apex, with the margin entire. The venation is camptodromic, and presents very remarkable characters. The midrib, in accordance with the delicate nature of the leaf, is very thin; the secondary veins issue at very acute angles, and ascend abruptly towards the margin, all undivided; the basal ones are opposite, and somewhat longer than the others. The tertiary veins are very fine, approximate, and transverse (compare the enlargement of the venation, Fig. 4A). These characters point most clearly to the family of the *Rhamneæ*, where in the genera *Berchemia, Pomaderris,* and *Rhamnus* we find species whose leaves possess more or less completely the peculiarities of the described fossil. The leaves of the Australian genus *Pomaderris*, in their lanceolate form and forwardly ascending secondary veins, correspond especially to our fossil (compare *Pomaderris ferruginea*, Sieb., Ettingshausen, Blattskelete der Dicotyledonen, p. 166, fig. 155, which shows basal secondary veins also). But *Pomaderris* differs from the fossil so widely in the coriaceous consistence of the leaves, and the more distant, stronger, and not transverse tertiary veins, that it cannot be included in that genus. The species of *Berchemia* have, it is true, more delicate leaves and fine approximate transverse tertiary veins, but the prominent basal veins are altogether wanting, which is also the case in the leaves of *Rhamnus.* The leaves of *Gouania* show more or less ascending secondary veins with transverse tertiary veins, but its basal secondary veins are more strongly developed, and have prominent exterior veins, which are entirely wanting in the described fossil; besides, these leaves are never lanceolate, but broad, ovate, or rounded, and cordate at the base. The Rhamneæ have numerous representatives in the Tertiary Flora.

Passing them under review, we happened on a narrow-leaved variety of *Berchemia multinervis*, A. Braun, which had been discovered in the strata of Sagor (see Ettingshausen, Foss. Flora von Sagor, Denksch. K. Akad. Wissensch, Wien, vol. xxxvii, Pl. XVI, figs. 8–10). This shows remarkable ascending secondary veins, and in its form approaches very nearly the Rhamneæ from Dalton, only the above mentioned basal veins are wanting also in the fossil *Berchemia.* We have, therefore, grounds enough for the erection of a special genus for the Rhamneæ just described, and which may be regarded as the ancestral genus of *Pomaderris.*

The species is named after [Sir Joseph] Banks, the English naturalist.

Locality and Horizon.—With the preceding species.

MYRTACEÆ.

EUCALYPTUS DELFTII, *sp. nov.*

Plate VI, Fig. 6.

Sp. Char.—E. foliis rigide coriaceis lanceolato-oblongis obtusiusculis, integerrimis; nervatione camptodroma; nervo primario apicem versus subflexuoso; nervis secundariis subangulis 30–40° orientibus, tenuibus marginem adscendentibus, cum nervo marginali anastomosantibus (?); nervis tertiariis obsoletis.

Obs.—A leaf whose strong, somewhat recurved margin indicates a remarkably rigid texture. At the base it can be restored into an oblong, almost lanceolate leaf, which is narrowed towards both ends and obtuse at the apex. The midrib is somewhat flexuous towards the apex, and not prominent on the upper surface of the fossil, whilst the under side is covered by the rock material.

Owing to this unfavourable circumstance, even the course of the fine and remarkably acute-angled secondary veins, but more especially their behaviour at the margin, cannot be observed with sufficient accuracy. In one place near the margin I thought I could perceive an indication of the marginal vein, with which the secondary veins are connected. Tertiary veins and reticulation have not been preserved. The form of leaf, texture, and venation just described are found in *Eucalyptus*, viz., in *E. teretiuscula*, and others (see Ettingshausen, Blattskelete der Dicotyledonen, Pl. LXXXV, fig. 17). As the assumption that *Eucalyptus* was not wanting in the Tertiary of Australia is, at all events, more probable than the contrary, so much the more as this genus occurs even in the Tertiary Flora of Europe, I believe the *Eucalyptus*-like leaf remains found amongst the plant fossils from Dalton may for the present be set down as in all probability a representative of *Eucalyptus*. A more detailed comparison of the species with hitherto-described fossil species of *Eucalyptus* can only be undertaken when more perfect material has been obtained.

I named this species after the Dutchman, Van Delft, who in the eighteenth century made important exploring journeys in Australia.

Locality and Horizon.—With the preceding species.

PAPILIONACEÆ.

DALBERGIA DIEMENII, *sp. nov.*

Plate VI, Fig. 16.

Sp. Char.—D. foliolis subcoriaceis, sessilibus, ovato-ellipticis, basi inæquilateris, apice obtusis, margine integerrimis; nervatione camptodroma; nervo primario distincto, recto excurrente; nervis secundariis tenuissimis, subangulis 50–60° orientibus, simplicibus, leviter curvatis; nervis tertiariis inconspicuis.

Obs.—This leaflet shows much similarity to that of *Dalbergia primæva*, Ung., but differs in the somewhat thinner texture, which in the species named is designated as coriaceous. In the other characters, as far as they are present, there is perfect correspondence; but a detailed comparison must be deferred until more complete specimens are obtained. In the meantime, I place the leaf fossil under *Dalbergia* as a peculiar species, which I name after the Dutchman, Van Dieman, one of the most meritorious promoters of Australian geographical science in the seventeenth century. In the American Tertiary Flora the *D. Lesquereuxii*, Ett.,* may be regarded as an analogous species.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit reposing on Silurian rocks.

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* *Dalbergia Lesquereuxii*, sp. nov. (*Vaccinium reticulatum*, Lesq., *loc. cit.*, Pl. LIX, fig. 6).

Obs.—The leaves of *Vaccinium reticulatum*, A. Braun, from the Tertiary Flora of Switzerland, with which Lesquereux compares the leaf figured in the work above quoted, have an obtuse apex, a stronger midrib, and a prominent reticulation. The leaf quoted from the tertiary strata of Florissant, however, is acuminate, has a midrib which is thin even at the base, very fine secondary veins, and no prominent reticulation. At all events, it belongs to another plant. The somewhat unequal development of the sides of its leaf is suggestive of a leaflet which appears to agree best with those of *Dalbergia primæva*, Ung. But as this latter is more acuminate and has a more obtuse base, the leaf fossil referred to should be regarded as the remains of a peculiar species whose nearest ally is the *D. primæva*.

CAESALPINIEÆ.

CASSIA COOKII, *sp. nov.*

Plate VI, Fig. 19.

Sp. Char.—C. foliolis coriaceis sessilibus (?), oblongo-ellipticis, basi rotundatis, inæquilateris, apice acuminatis, margine integerrimis; nervatione camptodroma; nervo primario valido, prominente, recto apicem versus angustato; nervis secundariis tenuissimis, sub angulis 65–75° orientibus; nervis tertiariis obsoletis.

Obs.—A leaflet which in its peculiarities resembles most nearly those of *Cassia naseolites,* Ung., but appears to have weaker secondary veins than the fossil plant named, so widely distributed in the Tertiary Flora of Europe. At the present time there are twenty-one species of *Cassia* endemic in Australia; it may therefore be assumed that *Cassia* existed there even during the Tertiary Epoch, and for these reasons the described leaflet may with so much the more probability be referred to that genus. So far, only one specie, of *Cassia** is known from the Tertiary Flora of North America.

I name this species, which appears to be distinct from *Cassia phascolites,* after the British Navigator, Captain Cook, who on behalf of the Royal Society of London, it is well known, made most important discoveries in Australia.

Locality and Horizon.—With the preceding species.

CASSIA FLINDERSI, *sp. nov.*

Plate VI, Fig. 18.

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [7th Plate], fig. 13.

Sp. Char.—C. foliolis subcoriaceis petiolatis ovato-ellipticis, basi inæqualibus, apice obtusis, margine integerrimis; nervatione camptodroma; nervo primario distincto recto excurrente; nervis secundariis tenuissimis; tertiariis inconspicuis.

Obs.—The occurrence of the genus *Cassia* in the Tertiary Flora of Australia is again made evident from this leaflet, which is similar to those of several existing and some fossil species. The species to which it belongs comes under a group differing from the preceding one. I name this species after the English naval officer, Flinders, who, towards the close of the last and the beginning of the present century, made valuable discoveries in Tasmania[*].

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* *Cassia podogonioides,* sp. nov. (*Podogonium americanum,* Lesquereux, *loc. cit.*, p. 289, Pl. LIX, fig. 5; Pl. LXIII, fig. 2; and pl. LXV, fig. 6).

Obs.—The leaflets of *Leguminosæ* figured by Lesquereux in the work quoted, have not the venation of *Podogonium,* but of *Cassia.* They want the acrodromic secondary veins at the base of the leaflets, which are characteristic of *Podogonium.* On the other hand, the venation of the leaflets shows more correspondence with those of *Cassia Zephyri,* Ett., and *C. Fischeri,* Heer, which also have a somewhat narrowed base. In form, and as regards the approximate secondary veins, the leaflets are certainly somewhat similar to those of *Podogonium.*

Locality and Horizon.—One-tree Point and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

LEGUMINOSITES KENNEDYI, *sp. nov.*

Plate VI, Fig. 17.

Sp. Char.—L. foliolis subcoriaceis, ovatis integerrimis, nervatione camptodroma, nervo primario distincto, recto; nervis secundariis subangulis 60–70° orientibus, leviter arcuatis simplicibus; nervis tertiariis inconspicuis.

Obs.—A leaflet which, as regards its character, may perhaps belong to *Cassia* also; but at present, owing to the imperfect condition of the preservation, the question cannot be decided with any degree of certainty. In the meantime, and until complete specimens shall permit an exact determination of the genus, I place it under the collective genus *Leguminosites*, and name the species after the deserving Australian traveller, Kennedy, who fell a victim to his zeal as an explorer.

Locality and Horizon.—Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks.

PLANTÆ INCERTÆ SEDIS.[†]

PHYLLITES POPULIFORMIS, *sp. nov.*

Plate VI, Fig. 7.

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [8th Plate], fig. 30.

Obs.—The leaf is apparently of rather delicate texture, ovate, entire on one side, and with an indication of a lobe on the other side. There are present two basal acrodromic, and besides, on either side, 4–5 camptodromic secondary veins. The leaf has some similarity to the leaves of *Populus;* but it might also belong to *Ficus*, or to the Sterculiaceæ.

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[*] [Around the coasts of Australia and Tasmania.—R.E., Jnr.]

[†] Of these no diagnosis are given, as to do so would be useless, on account of the too imperfect material. In view of the great importance which attaches to the exploration of the Tertiary Flora of Australia, however, even incomplete materials from which at least indications or hints may be derived for future researches should not be ignored, and we are therefore much obliged to Mr. R. M. Johnston for the publication of his drawings of the plant fossils discovered by him.

Locality and Horizon.—One-tree Point and Pipeclay Bluff, Carnelian Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds (see R. M. Johnston, *loc. cit.*, p. 14, &c.).

Collection.—R. M. Johnston.

PHYLLITES FICIFORMIS, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [6th Plate], fig. 11.

Obs.—The fossil shows one-half of a rather large fig-like leaf. It reveals a somewhat rigid texture. The margin is not preserved, but probably entire. The numerous secondary veins are camptodromic, and issue at slightly acute angles; the tertiary veins proceed on both sides of the secondaries at acute angles, but on both sides of the midrib at right angles.

Locality and Horizon.—With the preceding species.

PHYLLITES JUGLANDIFORMIS, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [8th Plate], fig. 28.

Obs.—The unequal sides indicate a leaflet. The texture appears to have been almost coriaceous. The form, supposing the missing apex to be restored, would be oblong ovate; the margin entire. The midrib is very prominent; the camptodromic secondary veins issue at slightly obtuse angles, 5–7 on either side. The tertiary veins are short, inserted mostly at nearly right angles. The leaflet may belong to *Juglans*, with the leaflets of which it has most similarity; but the Sapindaceæ, the Meliaceæ, and even the Papilionaceæ and the Cæsalpineæ are, however, not excluded. It might have been possible to decide this if a little more of the reticulation had been visible.

Locality and Horizon.—With the preceding species.

PHYLLITES LIGUSTROIDES, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [8th Plate], fig. 22.

Obs.—A leaf of delicate, more membranous texture, more oblong form, and entire margin. The base is acuminate, shortly petiolate, the apex roundedly obtuse. The venation is camptodromic. From a rather fine midrib issue on each side five fine simple secondary veins. Of tertiary veins and the reticulation, nothing has been preserved. The fossil appears to belong either to the Oleaceæ *(Ligustrum)* or the Daphnoidæ *(Daphne)*. It has, however, the greatest similarity with the leaves of *Ligustrum*.

Locality and Horizon.—With the preceding species.

PHYLLITES PYRIFORMIS, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [8th Plate], fig. 23.

Obs.—A broadly elliptical, entire, shortly petiolate leaf of apparently delicate texture, slightly acuminate at the base, but more acuminate towards the apex, which is somewhat injured. The venation is camptodromic, the few secondary veins ascending, bifurcating towards their ends, and forming apparently small loops at the margin. The tertiary veins are too imperfectly preserved to furnish a character. As far as it is possible to judge from the unmistakable characters present, the fossil appears to belong to the Pomaceæ, where in *Cydonia* and *Pyrus* similar forms of leaf occur.

Locality and Horizon.—With the preceding species.

PHYLLITES PHASEOLITES, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc. Tasmania, for 1881 [6th Plate], fig. 4.

Obs.—A small leaf, whose inequilateral development suggests a leaflet. It has an almost cordate form, a comparatively long petiolule and an apparently camptodromic venation. The margin is very indistinct. Supposing the margin to be entire, the leaflet should belong to the Phaseoleæ, where, namely, species of *Kennedya*, show very similar leaflets.

Locality and Horizon.—With the preceding species.

PHYLLITES SOPHORÆFORMIS, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania, for 1881 [6th Plate], fig. 9.

Obs.—This fossil likewise appears to be a leaflet of one of the Papilionaceæ. It reveals a thinner texture, is elliptical, asymmetrical in its two halves, entire, obtuse at both ends; the venation is camptodromic, with few, fine, ascending secondary veins. The fossil most nearly resembles the leaflets of *Sophora*.

Locality and Horizon.—With the preceding species.

PHYLLITES MIMOSÆFORMIS, *sp. nov.*

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania, for 1881 [9th Plate], fig. 31.

Obs.—A small indistinctly preserved leaf fossil, which most probably is a leaflet, and from its delicate nature more likely to be one of the Mimoseæ rather than a *Cassia*.

Locality and Horizon.—With the preceding species.

CARPOLITHES GAERTNERIOIDES, *sp. nov.*

Plate VI, Fig. 13.

Johnston, Notes, etc., Papers and Proc. R. Soc., Tasmania, for 1881 [9th Plate], fig. 34.

Obs.—An ovate fruit grown out of two bracteoles, which was not originally flattened, but whose actual shape has been produced by subsequent compression. In the middle is observed a sutural rib dividing the fruit into two halves, and on each half there are wrinkles, producing, generally, an indistinct cross-hatching. At the thickest portion of the rib must be the situation of the base of the fruit. On this supposition, the fruit would be remarkably similar to that of some Loganiaceæ, *e.g.*, *Gaertnera*. In the genus named we find an ovate dry drupe, covered by the calyx at the base, but easily disengaged, and enclosing two pyrenes. The latter, containing each one seed, have together the form of a plum, and fill up almost entirely the interior of the fruit, which is provided with only a thin covering of fleshy pulp. Where the flat internal surfaces of the pyrenes meet one another, a furrow is produced, which in a fossil fruit of this species might easily become more prominent, or even like a rib.

Locality and Horizon.—Pipeclay Bluff, Sandy Bay, Estuary of the River Derwent, Tasmania; Upper Tertiary Leaf beds.

Collection.—R. M. Johnston.

CARPOLITHES RISDONIANUS, *sp. nov.*

Plate VI, Fig. 14.

Obs.—A roundish, flattened, ribbed fruit, somewhat prolonged at one end. As yet it appears doubtful whether the remarkable flattening is the result of compression, or an original character of the fruit.

Locality and Horizon.—Risdon Tasmania; in yellow Travertin of Upper Tertiary age.

Collection.—British Museum (Natural History Branch).

CONTRIBUTIONS

TO THE

TERTIARY FLORA OF AUSTRALIA.

PART II.

Translated by the Author from the Original Memoir in the Denkschriften der Mathematisch-Naturwissenschaftlichen Classe der Kaiserlichen Akademie der Wissenschaften, Wien, 1886, liii, Bande.

I.—INTRODUCTION.*

Mr. C. S. Wilkinson, Government Geologist of New South Wales, had the kindness to entrust his collection of Australian Tertiary Plants to me, for which I now express my most sincere thanks. The present work follows the Memoir, "Contributions to the Tertiary Flora of Australia, Part I," published in the 47th vol. of the "Denkschriften" of the Imperial Academy of Sciences of Vienna.

It is highly satisfactory to me that the general results I obtained from my first efforts are not alone strengthened, but materially completed by this Second Part, which I now lay before the Academy. The results of both parts are based on exact determinations of fossils. But, considering it in some degree the duty of a careful examiner of a fossil flora, I have taken into consideration not only the plainly determinable objects, but also many more or less uncertain cases. Although I have never founded the before-mentioned results upon the latter cases, I have only employed an experience of almost forty years to interpreting the fossils as far as possible, for which the richest herbariums have been at my disposal. I trust I may not err in supposing that scientific persons will agree with my method, the more so, as it gives a complete review of the results obtained from a fossil flora.

Before recording the general results of my second contribution, I have to remark—to prevent misunderstanding—that I should be greatly obliged to any author in Phyto-palæontological science, who, having gained either experience, and supplied with better scientific means, would rectify my statements. I have, nevertheless, some grounds for declaring that time is too precious to permit of my entering into polemical disputes.

The one hundred and twenty-eight species of fossil plants, described in the following special part, mostly come from Vegetable Creek, near Emmaville, in New England, New South Wales; twenty-one species have been collected from Elsmore, and only five species from Tingha, in New England. Mr. C. S. Wilkinson, who has examined these localities, referred them to the Lower Tertiary formation. The species are distributed into thirty-six families and seventy-two genera. Of the former thirty-five, and of the latter fifty-two are also represented in the Tertiary Flora of Europe. Respecting the principal sections of the Vegetable Kingdom, the Cryptogamæ contain two species, the Gymnospermæ twelve, the Monocotyledons two, the Apetalæ fifty-six, the Gamopetalæ eleven, and the Dialypetalæ forty. Of the families represented by several species, the Proteaceæ contain twenty species, the Cupuliferæ fourteen, the Coniferæ eleven, the Myrtaceæ ten, the Laurineæ seven, the Leguminosæ six, whereas the Moreæ, Apocynaceæ, and Celastrineæ contain five species each.

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* [The substance of this Introduction appeared in the *Geological Magazine*, 1887, IV, p. 359, by Baron von Ettingshausen.—R. E., jnr.]

The results respecting the character of the flora confirm Mr. Wilkinson's statement. We cannot find any reason to suppose the above-named localities to be of other than the age stated. It is at first sight evident that the character of their flora (especially that of Vegetable Creek and Elsmore) deviates strikingly from that of the living Australian Flora. According to the latter difference which indicates a greater difference of age between both just named floras, as well as regarding the close relationship of some of its species to those of the Eocene and Cretaceous Periods, we may conclude that the Fossil Flora described here might be referred to the Lower Eocene.

When we take into consideration only those fossil species which are represented by fruits, seeds, and characteristic forms of leaves, we obtain new and sufficient proofs of the view which I brought to light in the First Part of these Contributions, that the elements of Floras are mixed together in the Tertiary Flora of Australia. I first alluded to this in a former paper ("Genetische Gliederung der Flora Australiens," Denksch. K. Akad. Wissensch. Wien, vol. xxxiv, p. 115). These proofs consist of facts relative to the common appearance of genera endemic in Australia, with genera represented in other floras, but which are foreign to the Australian one. For example, there occur in the fossil flora here described, the following genera of the Australian Element:—*Phyllocladus*, *Casuarina*, *Santalum*, *Persoonia*, *Grevillea*, *Hakea*, *Lomatia*, *Banksia*, *Dryandra*, *Callicoma*, *Ceratopetalum*, *Pomaderris*, *Boronia*, *and Eucalyptus*. On the other side we find here, intermixed with the former, types belonging to: *Sequoia* (California), *Myrica* (Europe, North America, Asia, South Africa), *Alnus* (Northern Hemisphere), *Quercus* (Northern Hemisphere, nine species), *Cinnamomum* (Asia), *Sassafras* (North America and East India), *Aralia* (North America, Japan, and New Zealand), *Elæocarpus* (Tropical Asia), *Acer* (Northern Hemisphere), *Copaifera* (Tropical America). In Part I, I have already stated that the elements of floras are united, not only in the Tertiary Flora of Europe, the Arctic Regions, North America, and of Australia, but also in the Tertiary Floras of other portions of the globe. The facts just mentioned confirm this even more strongly. Besides, I am able to state the same result from facts obtained by examining the Tertiary Flora of New Zealand, rich collections of which Prof. Dr. Julius von Haast and Prof. T. J. Parker kindly forwarded me.* There is now scarcely any doubt that the general character of all Tertiary Floras of the globe is one and the same in regard to the mixture which they exhibit, and carried, until the separation of the elements of floras into the special floras towards the present period.

The relationship of the Tertiary Floras of the globe to one another is based upon the common elements of floras. The comparison of the Australian Tertiary Flora to the European shows at once not only many families and genera which are common to both, but also that many species of the one are more or less closely allied to species of the other. For example, the following species are closely related:—*Callitris prisca* is closely related to *C. Brongniartii*, *Sequoia australiensis* to *S. Langsdorfii*, *Podocarpus præcupressina* to *P. elegans*, *Casuarina Cooki* to *C. sotzkiana*, *Alnus MacCoyi* to *A. Kefersteinii*, *Quercus Wilkinsoni to Q. chlorophylla*, *Q. Hartogi* to *Q. drymeja*, *Fagus Benthami* to *F. Feroniæ*, *Ficus Gidleyi* to *F. arcinervis*, *F. Solanderi to F. Reussii*, *F. Willsii* to *F. Jynx*, *Cinnamomum polymorphoides* to *C. polymorphum*, *C. Leichardtii* to *C. spectabile*, *C. Nuytsii* to *C. lanceolatum*, *Grevillea proxima* to *G. hæringiana*, *Banksia Lawsoni* to *B. Deikeana*, *B. Hovelli* to *B. hæringiana*, *B. myricæfolia* and *B. lancifolia* to *B. Ungeri*, *Dryandra Benthami* to *D. acutiloba*, *Callicoma primæva* to *C. pannonica*, *Ceratopetalum Macdonaldi* to *C. bilinicum*, *Elæocarpus Muelleri to E. Albrechti*, *Acer subproductum* to *A. trilobatum*, *A. subintegrilobum* to *A. integrilobum*. Regarding many other analogies and representatives of types, I refer to the affixed table, indicating the relationship of the Tertiary plants of Australia to those of Europe, of the Arctic Regions, and of North America.

I have selected the following few from among numerous new forms, as possessing greater interest.

A remarkable *Anomozamites* related to an *Anomozamites* of Greenland, indicates some affinity of the present flora to that of the Cretaceous Period. *Heterocladiscos*, a peculiar Cupressinea shows dimorphous branchlets, the primary ones being cylindrical, their leaves lanceolate close to one another in spiral order; the secondary ones being four-edged and their leaves rhomboidal-ovate, imbricate and set in four rows. Thus this remarkable plant combines the facies of *Glyptostrobus* with that of *Thuites Mengeanus,* a Cupressinea from the Amber. Most remarkable is the appearance of *Pseudopinus,* a representative genus of *Pinus,* which, perhaps, might be even a subgenus of *Pinus.* Cones, seeds, leafed branchlets, rachis of branchlets, and single leaves have been found at Vegetable Creek. The cones are smaller than those of any living *Pinus.* The size and form of the leaves, as well as their arrangement, and the shape of the branchlets remind us of *Pinus canadenis.* Besides *Phyllocladus,* two separate genera bearing phyllodes also occur at Vegetable Creek, *Palæocladus,* the primary branches of which are also phyllodineous, and *Ginkgocladus,* a genus common also to the Fossil Flora of New Zealand, and combining the facies of *Phyllocladus* with that of *Ginkgo.* A species of *Sassafras* has affinity to Cretaceous species as well as to an Eocene one of the European Tertiary Flora, and refers to an early state of the Tertiary Flora to which ours belongs. The same fact may be also admitted respecting some species of *Aralia.* Examples indicating the attachment of our flora to that of the Cretaceous Period appear, however, to be only isolated when we take into consideration its numerous analogies to real Tertiary plants.

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*A brief report on the Phyto-palæontological Investigations of the Fossil Flora of New Zealand (published in the "Denkschriften" of the Imperial Academy of Sciences of Vienna, vol. liii, p. 143), I give in the Appendix below.

Diemenia a peculiar genus of Laurineæ, uniting the facies of *Cinnamomum* with that of other Laurineæ *(Laurus, Persea),* occurs at Elsmore, where two species have been collected. Besides Proteaceæ showing their Australian type, the appearance of *Rhopala,* a genus of tropical America, is remarkable. It is represented in the beds of Vegetable Creek by two species. Not less worthy of note is the appearance of *Banksia* types, exhibiting leaves which are acuminate at their apex, and thus are closely allied to the *Banksiæ* of the European Tertiary Flora. Two species of *Boronia,* an Australian genus, have been found, one of which unites distinctly the characters of two living species. Doubtless the latter have been differentiated from their ancestor just mentioned. A calyx, in some degree corresponding to those of *Getonia* of the European Tertiary Flora, possesses a special interest.

It may be worthy of notice that *Fagus,* distributed over both hemispheres, is represented at Vegetable Creek not only by types of the Southern, but also by one of the Northern Hemisphere. Whilst the former, belonging to the section *Notofagus,* exhibit coriaceous and persistent leaves, the latter closely corresponds to *Fagus ferruginea,* a species of the section *Eufagus,* bearing membranaceous and deciduous leaves. In accordance with these facts, the representation of *Quercus*, in the Tertiary Flora of Australia, might be considered not less interesting. Leaves of *Quercus* have been collected at Vegetable Creek belonging to species analogous to those living in North America, Mexico, on the Lebanon, in East India, Japan, and the Isle of Hongkong. Whilst types of *Fagus* are still existing in the present flora of Australia, those of *Quercus* seem to be quite extinct there. But should ever a representative species of that genus in the living Australian Flora be discovered, it need not be considered a wonderful discovery. Manifold remnants of the Tertiary Flora elements are intermixed with that flora, as I have pointed out in the Memoir (Denkschriften, vol. xxxiv) quoted above.

Although the Tertiary Flora of Australia deviates very much from the living one, we find numerous points of connection between them. A species of *Callitris* closely approaches the *C. robusta*, R. Brown; a *Dammara* is very near to *D. australis*, Lamb.; a *Phyllocladus*, which on the one hand unites the characters of all the three living ones, is allied on the other to types of Mesozoic, especially Cretaceous Floras; the genera *Casuarina, Santalum, Persoonia, Grevillea, Hakea, Lomatia, Banksia, Dryandra, Callicoma, Ceratopetalum, Boronia,* and *Eucalyptus* are represented by species, more or less closely related to living Australian forms.

A brief synopsis of the conclusions drawn from the general results which the investigation of the Tertiary Flora of Australia have offered, may be given as follows:—

Firstly.—The geographical distribution of plants in Australia at the Tertiary Period deviated in many ways from the present one. Therefore the material for comparison obtainable from the present flora of Australia is not at all sufficient for the investigation of the Tertiary one, and must consequently be completed from other floras of the globe.

Secondly.—Types of plants of the Southern as well as of the Northern Hemisphere of the globe are associated together in the Tertiary Flora of Australia.

Thirdly.—The flora elements represented in the Tertiary Flora of Australia chiefly contain Phylones (original types), which are also common to the other Tertiary Floras of the globe. The general character of the Tertiary Flora of Australia cannot, therefore, be considered essentially different from those of the latter.

Fourthly.—The Australian Tertiary Flora in accordance with the preceding statements is but a part of one and the same common original flora, upon which all living floras of the globe are founded.

Fifthly.—The comparison of this original flora to the present floras of the globe shows that in Australia the differentiation of the original types is at its highest degree.

Sixthly.—Many analogies to the Tertiary Flora are nevertheless to be found in the living Australian Flora.

APPENDIX TO THE INTRODUCTION.

The genealogical relation of the living Flora of New Zealand to its Tertiary one has already formed the subject of a paper I submitted to the Imperial Academy of Sciences of Vienna under the title, "Genetische Gliederung der Flora von Neuseeland" (Sitzungsberichte, vol. lviii, Part I, p. 953). I have pointed out in it that the endemic New Zealand Flora not only contains types which may probably descend from the principal element of its Tertiary Flora, but also such ones probably derivable from some accessory elements of the latter flora.

Only a short time had elapsed since my attention had been again drawn to the subject, and I was able to lay a memoir before the above-named Academy, entitled, "Beitrage zur Kenntniss der fossilen Flora Neuseelands" (Contributions to the Fossil Flora of New Zealand, Denksch. K. Akad. Wissensh. Wien, vol. lii, Part I, 1887), in which I state, "It was my good fortune in 1884 to receive two collections of fossil plants from New Zealand, for which I am indebted to the kindness of Prof. Dr. Julius von Haast, of Christchurch, and Prof. T. J. Parker, of Dunedin."

Seventeen localities of fossil plants are here represented, which belong to three formations—the Tertiary, Cretaceous, and Trias.

The Tertiary Flora, collected from eight localities, as, Shag Point, Dunstan, Landslip Hill, Malvern Hills, Raca-cliff Gully, Weka-pass, Amuri, and Murderer's Creek, comprises till now, as far as investigation could bring to light, fifty-two species, which are distributed into thirty-nine genera, and twenty-six families. Of these species three are Cryptogamæ, eleven Gymnospermæ, two Monocotyledons, twenty-two Apetalæ, three Gamopetalæ, and ten Dialypetalæ. Regarding the general flora character, it by no means essentially deviates from that of the hitherto known Tertiary Flora. We find here the same mixed character as in the Tertiary Flora of Europe, North America, and Australia, the analogies of which to the New Zealand Tertiary species may easily be seen in the subjoined table.

Although the Tertiary Flora of New Zealand is very different from the living one, yet with regard to several species a close relationship is clearly indicated. Thus, *Aspidium tertiario-zeelandicum* and *A. novæ-zeelandiæ*, Presl., *Dammara Oweni* and *D. australis*, Lamb., *Podocarpus Parkeri* and *P. Totara*, Don., *Dacrydium præcupressinum* and *D. cupressinum*, Sol., &c., are closely allied. Besides, several genera, for instance, *Fagus*, *Hedycarya*, *Santalum*, *Loranthus*, &c., are represented in both, whereas others seem to be in a genetic relation to living ones, and the latter may in some degree be transmuted from the former. Thus, *Daphnophyllum* or *Laurophyllum* may have turned out to be *Nesodaphne*, likewise *Apocynophyllum* to *Parsonsia*, *Aralia* to *Schefflera*, *Sapindus* to *Alectryon*, &c. On the contrary, we miss in the recent (endemic) flora of New Zealand a considerable series of genera due to its Tertiary one; for example, *Lomariopsis*, *Sequoia*, *Araucaria*, *Seaforthia*, *Casuarina*, *Myrica*, *Alnus*, *Quercus*, *Ulmus*, *Planera*, *Ficus*, *Cinnamomum*, *Dryandra*, *Diospyros*, *Aralia*, *Acer*, *Sapindus*, *Elæodendron*, &c.

According to the preceding statements, the principal results of my Memoir are as follows:—

Firstly.—In New Zealand there exists a genetic relationship between its Tertiary and its living Flora.

Secondly.—The Tertiary Flora of New Zealand contains the elements of floras.

Thirdly.—The Tertiary Flora of New Zealand is a part of that universal Original Flora, from which all living floras of the globe descend.

Fourthly.—In New Zealand only one part of its Tertiary Flora has changed into its living flora; the other has become extinct.

I proceed now to communicate a brief record on the fossil plants occurring in the abovenamed localities.

I.—Of all the localities ascribed to the Tertiary formation that of Shag Point is the richest and most interesting. Of Cryptogamæ two species of *Aspidium*, and of Cycadeæ a specimen betraying some resemblance to *Zamites tertiarius*, Heer, has been found. Of Coniferæ we have ten species belonging to seven genera. They are fully enumerated in the table affixed below.

Of Monocotyledons one *Caulinites*, and of Dicotyledons a considerable series occur there, as follows:—One *Casuarina;* two species of *Myrica*, the one allied to *M. integrifolia*, Ung., of the European Tertiary Flora, the other similar to *M. quercifolia*, Linn., a native of the Cape of Good Hope; one *Alnus*, closely related to the European Tertiary *A. Kefersteinii*, as well as to the Australian Tertiary *A. Maccoyi;* four *Quercus*, one of them allied to *Q. macranthera*, native of the Caucasus, another related to the European Tertiary, *Q. Lonchitis*, Ung.; two species of *Fagus*, the one related to *F. procera* and *F. alpina*, both natives of Chili, the other very similar to *F. Deucalionis*, Ung., as well as to the North American *F. ferruginea;* one *Ulmus* and one *Planera*, both analogous to species of the European Tertiary Flora; one *Ficus*, a species corresponding to *F. lanceolata*, of the European Tertiary, and to *F. Burkei*, of the Australian Tertiary Flora; one *Hedycarya*, analogous to the Tertiary *H. europæ*, as well as to the Australian Tertiary, *H. Wickami;* one *Cinnamomum*, closely allied to *C. polymorphum* and *C. polymorphoides;* two *Cassia*, the one closely related to *C. phaseolites* and *C. phaseolitoides*, the other to *C. memnonia*. Besides, species of the genera *Santalum, Diospyros, Aralia, Loranthus, Acer*, and *Carpolithes*, have been found there, their analogues being represented in the Tertiary of Europe, North America, and Australia (as specified in the subjoined table).

From the flora of the above-mentioned locality we may safely conclude that it, and probably also the following localities, belong to the Lower Tertiary. As many species of this flora are closely related, or at least analogous to Eocene species, I refer it to the Eocene Period.

II.—From Dunstan the following species are now before us:—A *Lomariopsis* analogous to *L. bilinica* from the Eocene strata of Kutschlin, near Bilin, and related to *L. triquetra*, a native of Nepal; an *Aspidium*, which has also been collected from the preceding locality; and a *Seaforthia*, analogous to *S. Mellingii* of the Fossil Flora of Eibiswald, and to *S. robusta*, R. Brown, living in Australia.

III.—From Landslip Hill the following are derived:—*Sequoia*, also found at Shag Point; a *Dryophyllum*, being analogous to *D. lineare*, from the Eocene Flora of Sézanne; two *Apocynophyllum*, the one corresponding to *A. Helveticum*, of the European Tertiary, and to *A. Mackinlayi*, of the Australian Eocene Flora, the other related to *A. Tabernæmontana*, of the Fossil Flora of Radoboj; an *Elæodendron*, corresponding to *E. helveticum*, of the European Tertiary Flora, and to *E. curtipendulum*, a native of Norfolk Island.

IV.—At Malvern Hills, the following species have been found:—An *Araucaria* and a *Dammara*, both also occurring at Shag Point; a *Myrica*, representing the widely-spread Tertiary *Myrica lignitum;* a *Quercus*, coming also from Shag Point; a *Fagus*, corresponding to *F. Wilkinsoni*, of the Australian Tertiary; a *Planera*, which appears also at Shag Point and at Murderer's Creek; a *Cissophyllum*, approaching the genera *Cissites* and *Ampelophyllum*.

V.—At Raca-cliff Gully the following species have been found:—An *Alnus* and a *Quercus*, both also occurring at Shag Point; a *Sapindus*, corresponding to *S. falcifolius*, of the European, and to *S. caudatus*, of the American, as well as to *S. Gossei*, of the Australian Tertiary Flora.

VI.—From Weka-pass a *Daphnophyllum*, related to *D. ellipticum*, Heer, has been collected.

VII.—At Amuri a fragment of wood has been discovered. I referred it to *Dammara Oweni*, a species occurring also at Shag Point and at Malvern Hills.

VIII.—At Murderer's Creek the following species have appeared:—A *Quercus*, a *Planera*, a *Cinnamomum*, and a *Cassia*, all also collected from the preceding localities, I–V; a *Dryandra*, closely related to *D. acoutiloba*, of the European, and to *D. Benthami*, of the Australian Tertiary Flora.

The strata containing remains of Dicotyledons in New Zealand have been collectively called "Cretaceo-Tertiary." I have pointed out that some of the strata must be referred only to the Cretaceous, and the others only to the Tertiary Formation. Whilst the latter have already been taken into consideration in the preceding exposition, the following few lines may, I trust, be considered permissible to explain the results of my investigations on the Fossil Flora of the Cretaceous Formation. This flora has up till now been collected from four localities, as, Pakawau, Grey River, Wangapeka, and Reefton. It contains thirty-seven species, distributed into twenty-nine genera and seventeen families. Of these species, four are Cryptogamæ, eight Coniferæ, four Monocotyledons, thirteen Apetalæ, and eight Dialypetalæ. Gamopetalæ are wanting here. Several species seem to be the ancestors of Tertiary ones, particularly of the genera *Aspidium*, *Podocarpus*, *Dacrydium*, *Quercus*, *Fagus*, *Ulmus*, *Ficus*, *Cinnamomum*, *Dryandroides*, *Ceratopetalum*, *Cupanites*, &c. According to the closer relationship of some of these species to Tertiary ones, we may refer the abovementioned localities to the Upper Cretaceous Formation.

II.—TABLE of the TERTIARY PLANTS herein described, with their nearest FOSSIL and EXISTING ALLIES.

Tertiary Flora.				Existing Flora.
Australia.	Europe.	Arctic Regions.	North America.	
CRYPTOGAMÆ.				
Filices.				
Pteris Yarrensis, *Ett.*	P. bilinica, *Ett.*	P. sitkensis, *Heer.*	P. sitkensis, Heer	P. arguta, *Vahl.* Canaries.
Lygodium Strzeleckii, *Ett.*	L. Laharpii, *Heer.*		L. Marvinei, *Lesq.*	L. pinnatifidum, *Sw.* Brazil.
PHANEROGAMÆ.				
GYMNOSPERMÆ.				
Cycadeæ.				
Anomozamites Muelleri, *Ett.*				
Coniferæ.				
Callitris prisca, *Ett.*	C. Brongniarti, *Endl.*			C. robusta, *R. Br.* Australia.
Heterocladinean thujoides, *Ett.*	Thuyites Mengeanus, *G.*			
Pseudopinus Wilkinsoni, *Ett.*				
Sequoia australiensis, *Ett.*	S. Langsdorfii, *Br. sp.*	S. Langsdorfii	S. Langsdorfii	S. sempervirens. California.
Dammara intermedia, *Ett.*				Dammara, *A.* Australia.
„ podozamioides, *Ett.*				
Podocarpus præcupressina, *Ett.*	P. elegans, *Ett. in Hpe.*			P. cupressina, *R. Br.* New Zealand.
Dacrydium cupressinoides, *Ett.*				D. cupressinum, *Sol.* New Zealand.
Palæocladus cuneiformis, *Ett.*				
Ginkgocladus australiensis, *Ett.*				
Phyllocladus asplenioides, *Ett.*				Phyllocladus, *A.* Australia.
MONOCOTYLEDONES.				
GRAMINEÆ.				
Poacites australis, *Ett.*				
Bambusites arthrostylinus, *Ett.*				
DICOTYLEDONES.				
Apetalæ.				
PIPERACEÆ.				
Piper Feistmanteli, *Ett.*				P. excelsum, *Forst.* New Zealand.
CASUARINEÆ.				
Casuarina Cookii, *Ett.*	C. sotzkiana, *Ett.*			C. Decaisneana, *F. Muell.* Australia.
MYRICEÆ.				
Myrica Koninckii, *Ett.*	M. lignitum, *Ung.*		M. undulata, *Lesq.*	M. cerifera, *L.* North America.
„ præsalicina, *Ett.*	M. salicina, *Ung.*			

II.—TABLE of the TERTIARY PLANTS herein described, with their nearest FOSSIL and EXISTING ALLIES—*continued.*

Tertiary Flora.				Existing Flora.
Australia.	Europe.	Arctic Regions.	North America.	
BETULACEÆ.				
Alnus Maccoyi, *Ett.*	A. Kefersteinii, *Goep.*	A. Kefersteinii	A. Kefersteinii	A. glutinosa, *Gaertn.*, Europe.
CUPULIFERÆ.				
Quercus Wilkinsoni, *Ett.*	Q. chlorophylla, *Ung.*	....	Q. cineroides, *Lesq.*	Q. virens, *Ait.*, North America.
,, Greyi, *Ett.*	Q. elæna, *Ung.*	Q. elæna	Q. elæna	Q. mexicana, *H. et B.*
,, Austini, *Ett.*	Q. myrtilloides, *Ung.*	....	....	
,, Hartogi, *Ett.*	Q. drymeja, *Ung.*	Q. drymeja	Q. drymeja	Q. castaneæfolia, *C. A. M.*
, Darwinii, *Ett.*	Q. bournensis, *D. H.*	....	....	Q. oxyodon, *Miq.* East India.
,, hapaloneuron, *Ett.*	....	....	....	Q. glauca, *Th.* Japan.
,, Edelii, *Ett.*	Q. serra, *Ung.*	....	Q. serra.	
,, Dampieri, *Ett.*	Q. Hamadryadum, *Ung.*	....	....	Q. Hancei, *Benth.* Hongkong.
,, Blamingii, *Ett.*	....	....	.. ..	Q. Eyrei, *Benth.* Hongkong.
Dryophyllum Howitti, *Ett.*	D. subcretaceum, *Sap.*	.. ..	D. subfalcatum, *Lesq.*	
Fagus celastrifolia, *Ett.*	... .	....	....	F. fusca, *Hook.* New Zealand.
,, Muelleri, *Ett.*	....	....	....	F. Dombeyi, *M.* Chile.
,, Hookeri, *Ett.*	F. pygmæa, *Ung.*	....	....	F. obliqua, *M.* Chile.
,, Benthami, *Ett.*	F. Feroniæ, *Ung.*	F. Feroniæ, *Ung.*	F. Feroniæ, *Ung.*	F. ferruginea, *Ait.* N. America.
ULMACEÆ.				
Ulmophyllum oblongum, *Ett.*				
MOREÆ.				
Ficus Burkei, *Ett.*	F. lanceolata, *Heer*	....	F. lanceolata.	
,, Gidleyi, *Ett.*	F. arcinervis, *Heer.*			
,, Solanderi, *Ett.*	F. Reussii, *Ett.*			
,, Phillipsii, *Ett.*	F. dalmatica, *Ett.*	....	F. Dalmatica.	
,, Willsii, *Ett.*	F. jynx, *Ung.*	....	F. jynx.	
ARTOCARPEÆ.				
Artocarpidium Gregoryi, *Ett.*	Artocarpidium, sp.			
MONIMIACEÆ.				
Monimia vestita, *Ett.*	....	....	....	M. ovalifolia, *H. B. V.*
Hedycarya Wickhami, *Ett.*	H. europæa, *Ett.*	....	. ...	H. dentata, *Forst.* New Zealand.
LAURINEÆ.				
Cinnamonum polymorphoides, *M'Coy*	C. polymorphoides, *Br.* sp.	C. polymorphum	C. polymorphum	C. zeylanicum. *Blum.*
,, Leichhardtii, *Ett.*	C. spectabile, *Heer*	C. Kanii, *Heer*, sp.	C. mississipiense, *Lesq.*	
,, Nuytsii, *Ett.*	C. lanceolatum, *Ung.*			
Diemenia speciosa, *Ett.*				
,, perseæfolia, *Ett.*				
Laurus australiensis, *Ett.*	L. Swoszowiciana, *Ung.*	L. thulensis, *Heer.*	L. socialis, *Lesq.*	
Sassafras Lesquereuxii, *Ett.*	S. primigenium, *Sap.*	S. Ferretianum, *Mass.*	....	S. officinale, *Nees.* N. America.
SANTALACEÆ.				
Santalum Frazeri, *Ett.*	S. osyrinum, *Ett.*	....	S. americanum, *Lesq.*	
PROTEACEÆ.				
Persoonia Murrayi, *Ett.*	....	....	....	P. lucida, *R. Br.* Australia.
Grevillea proxima, *Ett.*	G. hæringiana, *Ett.*	... .	....	G. linearis, *R. Br.* Australia.
,, Wentworthi, *Ett.*				
Hakea Dulloni, *Ett.*				
Rhopala sapindifolia, *Ett.*	....	....	....	Rhopala, sp. Tropical America.
,, Parryi, *Ett.*	.. ..	.. ..	....	Rhopala, sp. Tropical America.
Lomatia Brownii, *Ett.*	....	....	....	L. longifolia, *R. Br.* Australia.
,, Finnisii, *Ett.*				
,, Evansii, *Ett.*	L. helicioides, *Sap.*	....	....	L. illicifolia, *R. Br.* Australia.

II.—TABLE of the TERTIARY PLANTS herein described, with their nearest FOSSIL and EXISTING ALLIES—*continued.*

Tertiary Flora.				Existing Flora.
Australia.	Europe.	Arctic Regions.	North America.	
PROTEACEÆ—continued.				
Lomatia Goyderi, *Ett.*	L. aqensis, *Sap.*	...	L. microphylla, *Lesq.*	
,, castaneæfolia, *Ett.*	...	...	L. Scottii, *Lesq.*, sp.	
Banksia Lawsoni, *Ett.*	C. Deikeana, *Heer*	...	Banksites, sp.	B. integrifolia, *R. Br.* Australia.
,, Poolii, *Ett.*	...	...		B. littoralis, *R. Br.* Australia.
,, Hovelli, *Ett.*	B. hæringiana, *Ett.*	...		B. collina, *R. Br.* Australia.
,, myricæfolia, *Ett.*	B. parschlugiana, *Ett.*	...		B. oblongata, *Cav.* Australia.
,, lancifolia, *Ett.*	B. Ungeri, *Ett.*	...		
,, Blaxlandi, *Ett.*	...	...		B. australis, *R. Br.* Australia.
,, Campbelli, *Ett.*	...	...		
Dryandra præformosa, *Ett.*	...	...	...	D. formosa, *R. Br.* Australia.
,, Benthami, *Ett.*	D. acutiloba, *Ett.*			
Gamopetalæ.				
OLEACEÆ.				
Olea Macintyrei, *Ett.*	Olea, sp.	...	O. præmissa, *Lesq.*	O. apetala, *Vahl.* New Zealand.
APOCYNACEÆ.				
Apocynophyllum Kingii, *Ett.*				
,, Warburtoni, *Ett.*	A. hæringianum, *Ett.*			
,, Mackinlayi, *Ett.*	A. œningense, *Heer.*			
,, crassum, *Ett.*	A. pavifolium, *Ett.*			
Apocynocarpum sulcatum, *Ett.*				
ASPERIFOLIÆ.				
Trachyphyllum myosotinum, *Ett.*				
,, obtusum, *Ett.*				
MYRSINEÆ.				
Myrsine Stokesii, *Ett.*	M. Endymionis, *Ung.*	M. grœnlandica, *Heer.*	...	M. salicifolia, *De C.*
SAPOTACEÆ.				
Sapotacites Forresti, *Ett.*	S. sideroxyloides, *Ett.*			
,, Huntei, *Ett.*	S. lanccolatus, *Ett.*			
Dialypetalæ.				
ARALIACEÆ.				
Aralia Freelingii, *Ett.*	A. multifida, *Sap.*	...	...	A. elegans. New Granada.
,, prisca, *Ett.*	A. primigenia, *De la H.*	A. Jörgenseni, *Heer.*	A. dissecta, *Lesq.*	
,, Oxleyi, *Ett.*				
,, elsmoreana, *Ett.*				
LORANTHACEÆ.				
Loranthus Kennedyi, *Ett.*	...	...	...	L. myrtifolius. L. celastroides. Australia.
SAXIFRAGACEÆ.				
Callicoma primæva, *Ett.*	C. pannonica, *Ung.*	...	...	C. serratifolia. Australia.
Ceratopetalum Macdonaldi, *Ett.*	C. bilinicum, *Ett.*			
,, Gilesii, *Ett.*	...	...	...	C. gumiferum. S. Australia.
TILIACEÆ.				
Elæocarpus Muelleri, *Ett.*	E. Albrechti, *Heer.*	...	...	E. sphæricus, *Gærtn.*
ACERINEÆ.				
Acer subproductum, *Ett.*	A. trilobatum, *A. Br.*	A. trilobatum.	A. trilobatum.	A. rubrum, *L.* North America.
,, subintegrilobum, *Ett.*	A. integrilobum, *Web.*	...	A. indivisum, *Lesq.*	

II.—TABLE of the TERTIARY PLANTS herein described, with their nearest FOSSIL and EXISTING ALLIES—*continued.*

Tertiary Flora.				Existing Flora.
Australia.	Europe.	Arctic Regions.	North America.	
MALPIGHIACEÆ.				
Banisteriophyllum australe, *Ett.*	....	....	....	Tropical America.
Malpighiastrum Babbagei, *Ett.*	Malpighiastrum, sp.	....	....	
SAPINDACEÆ.				
Sapindus Gossei, *Ett.*	S. dubius	S. undulatus, *Heer*	S. caudatus, *Lesq.*	
Cupanites Selwyni, *Ett.*				
CELASTRINEÆ.				
Celastrus præeuropæus, *Ett.*	C. europæus, *Ung.*	Celastrus, sp.	....	C. myrtifolius. Jamaica.
,, præelænus, *Ett.*	C. elænus, *Ung.*	....	....	C. sp., Cape of Good Hope.
,, Lefroyi, *Ett.*	C. Andromedæ, *Ung.*	....	C. fraxinifolius, *Lesq.*	C. glaucus. *Salt.*
Elæodendron subdegener, *Ett.*	E. degener, *Ung.*, sp.			
ILICINEÆ.				
Ilex Macleayna, *Ett.*	I. berberidifolia, *Heer*	....	S. subdenticula, *Lesq*	I. cassine, *Ait.* North America.
RHAMNEÆ.				
Pomaderris Banksii, *Ett.*				
DIOSMEÆ.				
Boronia Harrisi, *Ett.*	....	....	....	B. serrulata. S. Australia.
,, Hookeri, *Ett.*	....	....	....	B. alata. Australia.
COMBRETACEÆ.				
Getonites Wilkinsoni, *Ett.*	Getonia, sp.			
MYRTACEÆ.				
Eucalyptus Mitchelli, *Ett.*	E. oceanica, *Ung.*	....	....	E. rudis, *Endl.* Australia.
,, Diemenii, *Ett.*	....	....	....	E. marginata. S. Australia.
,, Houtmanni, *Ett.*	E. Haidingeri, *Ett.*	....	E. americana, *Lsq.*	
,, Hayi, *Ett.*	E. hæringiana, *Ett.*	....	E. hæringiana	E. resinifera. S. Australia.
Callistemophyllum Hackii, *Ett.*	C. bilinicum, *Ett.*			
,, Beckeri, *Ett.*	C. melaleucæforme, *Ett.*	C. Moorii, *Heer.*	....	Callistemon spesiosum. Australia.
,, obliquum, *Ett.*				
,, Swindeni, *Ett.*	C. acuminatum, *Ett.*			
Myrtonium obtusifolium, *Ett.*				
,, lanceolatum, *Ett.*				
PAPILIONACEÆ.				
Dolichites coriaceus, *Ett.*	D. maximus, *Ung.*			
Dalbergiophyllum affine, *Ett.*	Dalbergia, sp.	....	Dalbergia, sp.	
CÆSALPINIEÆ.				
Cassia castanospermoides, *Ett.*				
,, phaseolitoides, *Ett.*	C. phaseolites, *Ung.*	....	....	C. micranthera, *De C.* Brazil.
Podogonium macrocarpum, *Ett.*	P. Knorrii, *Heer.*			
Copaifera australiensis, *Ett.*	C. radobojana, *Ung.*	....	....	Copaifera, sp. Brazil.
PLANTÆ INCERTÆ SEDIS.				
Sapinostrobus dubius, *Ett.*				
Carpolithes amaranthaceus, *Ett.*				
,, pygeoides, *Ett.*				
,, morisoniæformis, *Ett.*				
,, wetherellioides, *Ett.*				

III.—TABLE of the TERTIARY PLANTS of NEW ZEALAND.

Tertiary Flora.				Existing Flora.
New Zealand.	Europe.	North America.	Australia.	
CRYPTOGAMÆ.				
Filices.				
Lomariopsis dunstanensis, *Ett.*	L. bilinica, *Ett.*	....	....	L. triquetra, *Wall.*
Aspidium otagoicum, *Ett.*	A. serrulatum, *Heer*	....	....	A. stramineum, *Kaulf.*
,, tertiario-zeelandicum, *Ett.*	....	....	....	A. novæ-zeelandiæ, *Pr.*
PHANEROGAMÆ.				
GYMNOSPERMÆ.				
Cycadeæ.				
Zamites, sp.	Z. tertiarius, *Heer.*			
Coniferæ.				
Taxodium distichum-eocenicum, *Ett.*	T. distichum-miocenicum.	T. distichum-miocenicum.	....	T. distichum, *Rich.*
Sequoia novæ-zeelandiæ, *Ett.*	S. Couttsiæ, *Heer*	S. affinis, *Lesq.*	S. australiensis, *Ett.*	S. sempervirens, *Endl.*
Pinus, sp. ?				
Araucaria Haastii, *Ett.*	....	....	....	A. chilensis, *Mirb.*
,, Danai, *Ett.*	A. Sternbergii, *Gœpp.*	....	....	A. excelsa, *R. Brown.*
Dammara Oweni, *Ett.*	....	....	D. intermedia, *Ett.*	D. australis, *Lamb.*
,, uninervis, *Ett.*	....	....	... .	D. ovata, *Moore.*
Podocarpus Parkeri, *Ett.*	P. stiriaca, *Ett.*	Podocarpus, sp	....	P. Totara, *Don.*
,, Hochstetteri, *Ett.*	P. elegans, *De l'H.*	....	D. præcupressina, *Ett.*	P. tenuifolia, *Dec.*
Dacrydium præcupressinum, *Ett.*	....	....	D. cupressinoides, *Ett.*	D. cupressinum, *Sol.*
MONOCOTYLEDONES.				
Najadeæ.				
Caulinites otagoicus, *Ett.*	C. radobojensis, *Ung.*	C. sparganioides, *Lesq.*		
PALMÆ.				
Seaforthia zeelandica, *Ett*	S. Mellingii, *st.* sp.	....	....	S. robusta, *R. Brown.*
DICOTYLEDONES.				
Apetalæ.				
CASUARINEÆ.				
Casuarina deleta, *Ett.*	C. sotzkiana, *Ett*	....	C. Cookii, *Ett.*	Casuarina, sp.
MYRICEÆ.				
Myrica subintegrifolia, *Ett.*	M. integrifolia, *Ung.*	M. Bolanderi, *Lesq.*	M. pseudosalix, *Ett.*	
,, proxima, *Ett.*	M. lignitum, *Ung.*	M. undulata, *Lesq.*	M. Konincki, *Ett.*	M. cerifera, *L.*
,, præquercifolia, *Ett.*	....	....	....	M. quercifolia, *L.*
BETULACEÆ.				
Alnus novæ-zeelandiæ, *Ett.*	A. Kefersteinii, *Gœpp.*	A. Kefersteinii	A. Maccoyi, *Ett.*	A. glutinosa, *Gaertn.*
CUPULIFERÆ.				
Quercus Parkeri, *Ett.*	.. ..	....	....	Q. macranthera, *F. et M.*
,, deleta, *Ett.*	....	....	....	Q. corrugata, *Hook.*
,, celastrifolia, *Ett.*	Q. tephrodes, *Ung*	Q. Ellisiana, *Lesq.*	....	Q. aquatica, *Walt.*
,, lonchitoides, *Ett.*	Q. lonchitis, *Ung.*	Q. Drymeja, *Ung.*	Q. drymejoides, *Ett.*	
Dryophyllum dubium, *Ett*	D. lineare, *Sap.*	....	D. Howitti, *Ett.*	
Fagus ulmifolia, Ett.	....	....	....	F. procera, *P. et Endl.*
,, Ninnisiana, *Ung.*	F. Deucalionis, *Ung.*	F. Feroniæ, *Ung.*	F. Benthami, *Ett.*	F. ferruginea, *Ait.*
,, Lendenfeldi, *Ett.*	....	....	F. Wilkinsoni, *Ett.*	F. Moorei, *Muell.*
ULMACEÆ.				
Ulmus Hectori, *Ett.*	U. Braunii, *Heer*	U. tenuinervis, *Lsq.*		
Planera australis, *Ett.*	P. Ungeri, *Ett.*	P. Ungeri	....	P. Richardi, *Spach.*

III.—TABLE of the TERTIARY PLANTS of NEW ZEALAND—*continued.*

Tertiary Flora.				Existing Flora.
New Zealand.	Europe.	North America.	Australia.	
MOREÆ.				
Ficus sublanceolata, *Ett*	F. lanceolata, *Heer*	F. lanceolata	F. Burkei, *Ett.*	
MONIMIACEÆ.				
Hedycarya præcedens, *Ett.*	H. europæa, *Ett.*	....	H. Wickami, *Ett.*	H. australasica, *De. Cand.*
LAURINEÆ.				
Cinnamomum intermedium, *Ett.*	C. polymorphum, *A.B.*	C. polymorphum	C. polymorphoides, *McCoy.*	C. Camphora, *L.*
Laurophyllum tenuinerve, *Ett.*				
Daphnophyllum australe, *Ett.*				
SANTALACEÆ.				
Santalum subacheronticum, *Ett.*	S. acheronticum, *Ett.*	S. americanum, *Lesq.*	S. Frazeri, *Ett.*	Santalum, sp.
PROTEACEÆ.				
Dryandra comptoniæfolia, *Ett.*	D. acutiloba, *Ett.*	....	D. Benthami, *Ett.*	D. formosa, *R. Brown.*
Gamopetalæ.				
APOCYNACEÆ.				
Apocynophyllum elegans, *Ett.*	A. helveticum, *Heer*	....	A. Mackinlayi, *Ett.*	
,, affine, *Ett.*	A. Tabernæmontana, *Ung.*			
EBENACEÆ.				
Diospyros novæ-zeelandiæ, *Ett.*	D. lotoides, *Ung.*			
Dialypetalæ.				
ARALIACEÆ.				
Aralia Tasmanii, *Ett.*	....	A. dissecta, *Lesq.*	A. prisca, *Ett.*	
LORANTHACEÆ.				
Loranthus otagoicus, *Ett.*	....	....	....	L. tetrandrus, *R. et P.*
ACERINEÆ.				
Acer subtrilobatum, *Ett.*	A. trilobatum, *A.B.*	A. trilobatum	A. subproductum, *Ett.*	A. rubrum, *L.*
SAPINDACEÆ.				
Sapindus subfalcifolius, *Ett.*	S. falcifolius, *A. Br.*	S. caudatus, *Lesq.*	S. Gossei, *Ett.*	
CELASTRINEÆ.				
Elæodendron rigidum, *Ett.*	E. helveticum, *Heer*	....	....	E. curtipendulum, *Endl.*
AMPELIDEÆ.				
Cissophyllum malvernicum, *Ett.*				
MYRTACEÆ.				
Eucalyptus dubia, *Ett.*	E. oceanica, *Ung.*	E. americana, *Lesq.*	E. Mitchelli, *Ett.*	Eucalyptus, sp.
PAPILIONACEÆ.				
Dalbergia australis, *Ett.*	D. bella, *Heer.*			
CÆSALPINIEÆ.				
Cassia pseudophaseolites, *Ett.*	C. phaseolites, *Ung.*	C. phaseolites	C. phaseolitoides, *Ett.*	C. micranthera, *De. C.*
,, pseudomemnonia, *Ett.*	C. Memnonia, *Ung.*			
PLANTÆ INCERTÆ SEDIS.				
Carpolithes otagoicus, *Ett.*	C. Websteri, *Heer.*			

DESCRIPTION OF SPECIES.

CRYPTOGAMÆ.

Filices.

PTERIS TORRESII, *sp. nov.*

Plate VIII, Fig. 1.

Sp. Char.—P. fronde pinnata, pinnis pinnatifidis, lobis suboppositis, inæqualibus, ovalibus vel lanceolatis, acutis serrulatis; nervatione Alethopteridis; nervo primario tenui; nervis secondariis angulis acutis exeuntibus, furcatis ramis abbreviatis.

Obs.—Only a small fragment of this fern (Pl. VIII, fig. 1), has been collected. Fortunately this well-preserved specimen permits one to establish a series of characters which suffice for the correctness of its deterpinnate. The frond, of more membranaceous than coriaceous texture is pinnate; the pinnæ are pinnately divided or equally lobed; the lobes are 18-14 millimeters long and 5-6 centimeters broad, nearly opposite, more or less oblique to the rachis, ovate or lanceolate, and acute-serrulate. The nervation, showing the *Alethopteris*-type, consists of a tender primary nerve, which turns off at a more or less acute angle, and of 7-8 very fine secondary nerves on each side, which pass under acute angles. The primary nerve is still distinctly to be seen on the apex; the secondary nerves are catadromic, and all separated, forking once with short branches, terminating the teeth. Fructification is not visible.

These characters and the nature of the described fossil lead perceptibly to the genus *Pteris*. Through a more general comparison with similar ferns, we may even discover species of *Aspidium*, *Cyathea*, and *Alsophila*, which have a more or less striking resemblance with the described fossil. We shall see whether either of the genera mentioned can come into consideration relating to its determination. The pinnæ of *Aspidium spectabile,* Kunze, possess lobes resembling those of the fossil, but the secondary nerves are already forked at their base, therefore the branchlets lengthen. *Aspidium alsophilaceum,* Kunze, and *A. monostichum,* Kunze, have lobes of the pinnæ which are very similar in form and size to those of our fossil, but the borders are entire, and the secondary nerves simple. Other species of the same genus, notwithstanding that their form and nervation of the pinnæ resemble our species more or less, show an anadrome arrangement of the secondary nerves. More distantly comparable are *Cyathea* and *Alsophila.* Only *C. ebenica,* Karst., and *A. nitida,* Kunze, might perhaps be mentioned as having in some degree a similarity to the fossil. But in the former the angles of divergence of the lobes are more obtuse; in the latter the secondary nerves are mostly undivided. While we have ascertained that the above named genera give in one or the other respect too few arguments to render their affinity with the described fossil probable, we find on the other hand, that several species of *Pteris* have the most remarkable likeness to it, and therefore we do not doubt that it is a fragment of the sterile frond of a *Pteris.* Of the living species of this genus the following are more or less closely allied to the fossil. *Pteris coriacea,* Desv., a native of Peru, *P. tenuis,* Cunningh., from New Zealand, *P. tremula,* R. Brown, from Australia, and especially *P. arguta,* Vahl, from the Azores and Canary Islands. (Ettingshausen, Farnkräuter, Pl. LV, fig. 5; Pl. LVIII, figs. 1, 2; Pl. LX, figs. 7, 9; Pl. LXII, fig. 3.)

Of the already described fossil species, *Pteris sitkensis,* Heer, from the Tertiary of Alaska and Greenland, is very closely allied to *Pteris Torresi.* The latter differs only by more obtuse angles of divergence of the secondary nerves. Less closely related is *P. frigida,* Heer, from the Atane beds of Greenland, which possesses longer and narrower pinnulæ. Closely allied to our fossil amongst the European Tertiary species is *Pteris bilinica,* Ettingshausen, which only differs by more diverging lobes with entire borders. From *P. Humei,* Ett., the present species differs, by the secondary nerves being closer to one another, as well as by the more distinctly dentate borders of the lobes.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the old Rose Valley Lead (stanniferous) on the main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

LYGODIUM STRZELECKII, *sp. nov.*

Plate VIII, Figs. 2, 2A.

Sp. Char.—L. fronde sterili partita vel simplice (?) lobis oblongis obtusis, margine denticulatis; nervatione Neuropteridis; nervo primario distincto; nervis secundariis subangulis acutis orientibus, tenuissimis, densis, dichotomis.

Obs.—A small fragment of a sterile frond, betraying a membranaceous consistence. It shows a primary nerve, thin, straight, and disappearing below the roundish-obtuse apex; whilst the secondary nerves approaching one another are very tender, springing off under acute angles, and dichotomous. Their branchlets are mostly lengthened and bent divergingly, crapedodrome to small teeth. The probable construction of the fragments conducts to an oblong or oval form. It accords very well with the sterile fronds of *Lygodium*, especially to the frond of *L. pinnatifidum*, Swartz, toothed on the borders (see Ettingshausen, Farnkräuter, Pl. CLXX, fig. 10). The similar pinnæ of *Osmunda* have mostly untoothed borders, or, if toothed finely, have less densely arranged secondary nerves.

The final determination of the species must, however, be postponed in order that the discovery of more perfectly preserved fossils may give satisfactory results.

Locality and Horizon.—With the preceding species.

PHANEROGAMÆ.

Cycadeæ.

ANOMOZAMITES MUELLERI, *sp. nov.*

Plate VIII, Figs. 19–22

Sp. Char.—A. foliis profunde pinnatisectis, junioribus, nunc tota longitudine, nunc solum in superiore parte inciso-lobatis, linearibus vel lineari-lanceolatis, acuminatis, petiolatis, pinnis vel lobis rachi angulo acuto insertis, approximatis ovatis vel oblongis acutis vel acuminatis, æqualibus, plus minusve curvatis, integerrimis; nervis simplicibus, parallelis, æqualibus.

Obs.—This most remarkable plant is represented by several very distinct specimens, showing different states of development of the leaf. Figs. 19–21 belong to those which have completed their growth, although some are of various sizes. Figs. 20 and 21 show a lower part with the base; Fig. 19 an upper part of a leaf. On the specimen Fig. 20 the petiole is 4 millimeters long; but it is broken off in the specimen Fig. 21. The form of the leaf is small, lanceolate or lineal, narrowed gradually toward the apex, in the whole length conformingly dissected into ovate or oblong pinnæ, or lobes, which are oblique to the rachis, and usually a little convergingly curved, entire and very closely and equally striate with thin and simple nerves (see Fig. 20A, magnified). The texture is more membranaceous than coriaceous, or it may perhaps be called thinly coriaceous. The fragment, Fig. 22, shows an earlier state of development of the leaf, in which the segments or lobes are less separated and more ovate, less acute or, as in Fig. 20, roundly obtuse. These qualities may justify the generic reference of this fossil plant, though, according to Schimper, the characters of the pinnæ and nerves do not fully correspond to those of *Anomozamites*, as all the Trias, Jura, and Wealden species possess leaves, whose pinnæ and nerves are perpendicular to the rachis. One species, however, from the Cretaceous of North Greenland, described by Heer, shows by its nerves, in some degree oblique to the rachis, a remarkable and specific relation to the fossil from the Eocene beds of Vegetable Creek.

I named this species in honor of Baron Ferdinand von Mueller, of Melbourne, whose great merits in furthering the Present and Fossil Flora of Australia, are universally known.

Locality and Horizon.—Old Rose Valley Lead, with the preceding species.

Coniferæ.

CUPRESSINEÆ.

CALLITRIS PRISCA, *sp. nov.*

Plate VIII, Figs. 3, 4.

Sp. Char.—C. ramulis gracilibus, sæpius dichotome divisis, foliis lateralibus linearibus, adpressis, vix apice breviter acuto liberis.

Obs.—Very tender forked branchlets which very much resemble those of *Callitris Brongniartii,* var. *gracilis,* from the Tertiary Flora of Haering. But the remains from Vegetable Creek are still more slender and thinner than the latter. Of the mere fragments from the above locality, the best are now figured (Figs 3 and 4, natural size, fig. 3A magnified).

Of the living species, the Australian *Callitris robusta,* R. Brown (*Frenela,* Cunningh.), may be the nearest ally of the fossil.

Locality and Horizon.—Old Rose Valley Lead, with the preceding species.

Genus—HETEROCLADISCOS.

Gen. Char.—Cupressineæ ramulis foliisque dimorphis, foliis in ramulis adultioribus spiraliter dispositis dense confertis; in ramulis junioribus decussatim oppositis quadrifariam imbricatis.

HETEROCLADISCOS THUJOIDES, *sp. nov.*

Plate VIII, Figs. 5–7.

Sp. Char.—H. ramulis strictis squarrosis, follis ramulorum adultiorum ovato-lanceolatis acuminatis subpatentibus; juniorum minoribus ovato-rhombeis, obtusis, dorso convexo carinatis, arcte adpressis, ramulos tetragonos formantibus.

Obs.—A very remarkable cupressus-like conifer, which shows the type of *Glyptostrobus* in its primary branchlets, but that of *Thuites Mengeanus,* Goepp., from the Amber, in its secondary ones. The former are cylindrical, and bear lanceolate and acuminate leaves, which are arranged close to one another in spiral order, only with the base oppressed (See Pl. VIII, fig. 5A, magnified). The latter are four-edged, bearing rhomboidal or broad ovate leaves, which are arranged in four rows, imbricate, and quite oppressed. Their apex is somewhat obtuse, and their exterior plain vaulted, with an obtuse midrib. (See Pl. VIII, fig. 6A, magnified.) The branchlets, especially the secondary, are straight, stiff, and squarrose. The peculiar similarity of the secondary branchlets to those of *Thuites Mengeanus* may be due to the arrangement of the leaves, but those of the latter species are acuminate.

Locality and Horizon.—Old Rose Valley Lead, with the preceding species.

ABIETINEÆ.

Genus—PSEUDOPINUS.

Gen. Char.—Strobili parvi subglobosi squamæ plures axi spiraliter insertæ, imbricatæ, apice in apophyim irregulariter verrucosam incrassatæ, persistentes. Folia solitaria, perennia, plana, breviter petiolata.

PSEUDOPINUS WILKINSONI, *sp. nov.*

Pl. VIII, Figs. 12–18.

Sp. Char.—P. foliis brevibus rigidiusculis linearibus obtusis, basi in petiolum brevem attenuatis, sulco lævi longitudinali notatis; pulvinis ramo adnatis decurrentibus, sursum incrassatis, cicatricibus semi-orbicularibus; strobilis ovali-subglobosis 8–12^{mm} longis, 5–8^{mm} latis, squamis minimis crassiusculis convexis sublignescentibus, apice rotundato-obtusis, apophysi paullo prominente subrhombea verrucosa apicali; seminibus minimis alatis, ala nucleo duplo longiore, truncata.

Obs.—A most remarkable Abietinea, which is on one side related to the genus *Inolepis* of the Cretaceous Flora of North Greenland, and on the other to *Pinus*, a genus wanting in the Southern Hemisphere at the present time. It is represented by cones and their impressions, seeds, leafed and unleafed branchlets, rachis of branchlets, and separate leaves. The cones are still smaller than in *Inolepis*, which, I believe, does not belong to the Cupressineæ but to the Abietineæ. Both genera nearly correspond with each other in the shape of the cones, and in the arrangement and form of the scales. But our genus differs from *Inolepis* by other qualities of the scales, being more numerous, not coriaceous but ligneous, on their back somewhat verrucose, and on the apex noted with a small, nearly rhomboidal summit or apophysis. The latter, in Fig. 14A, representing a fragment of a scale magnified, shows some verrucous structure. Of longitudinal ribs, like those of *Inolepis*, there are no traces, but only equally thin striæ are visible. Close to an impression of a cone, I have seen on the same stone a very small seed (Fig. 15, natural size, Fig. 15A, magnified). It shows a roundish oval nucleus, and a very tender wing, which is scarcely twice the length, thin, membranaceous and truncate. Notwithstanding its smallness, it resembles much the winged seeds of a *Pinus*.

With the remains above-mentioned some small, lineal, pinus-like, leaves are found, which no doubt belong to the same species. The best one is figured in Fig. 17. It is flat, obtuse at the base, narrowed into a very short petiole and bears a longitudinal furrow. Its impression on the stone betrays a coriaceous texture. Fig. 16 (16A magnified) represents the rachis of a branchlet which shows several scars of leaves close to one another. They resemble very much those of the tribe *Tsuga* of *Pinus*, especially of *P. canadensis*. Close to another specimen of a rachis, not figured here, there is to be seen a separate leaf exactly of the shape above described. No doubt it belongs to the same rachis, and the leaves evidently appear to have been deciduous.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay under basalt. Watson's Starlight Claim, Tingha; carbonaceous clay from Deep Lead (stanniferous) under basalt.

SEQUOIA AUSTRALIENSIS, *sp. nov.*

Plate VIII, Figs. 8–11.

Sp. Char.—S. foliis rigide coriaceis, linearibus, acutis, planis patentibus distichis, confertis, basi attenuata adnato-decurrentibus, nervo mediano vix prominente, distincto; strobilis subglobosis, squamis compluribus peltatis.

Obs.—The leafed branchlets, Figs. 9, 10A and 11A (magnified) are very similar to those of *Sequoia Langsdorfii*, but are distinguished from the latter by having the leaves narrowed towards the base and apex, and by the possession of a middle rib, although broad, but very little obtruding. The strongly carbonized cone, Fig. 8, is almost globular, and at the same time agrees in the size and form of the scales with that of *S. Langsdorfii.*

Locality and Horizon.—Old Rose Valley Lead, with the preceding species. Watson's Starlight Claim, Tingha; carbonaceous clay from Deep Lead (stanniferous) under basalt.

DAMMARA INTERMEDIA, *sp nov.*

Plate VIII, Figs. 34–38.

Sp. Char.—D. squamis late cuneatis, margine prope basin utrinque integris, apicem versus incrassatis, apice obtusissimo subtruncato sursum verso; foliis coriaces, ovali-lanceolatis vel lanceolatis utrinque angustatis, apice obtusis vel obtusiusculis, basi brevissime petiolatis, tenuiter striatis.

Obs.—The scales of the cone here figured, Figs. 36 and 37, belong to *Dammara*, which, like those of *Araucaria*, easily loosen upon ripening. They are short, cuneate, on their upper margin as broad as long, somewhat inflated or thick, and almost truncate, but on the flat side diveringly and thinly striate. Their margins are nonserrate. The leaves, Figs. 34, 35, and 38, belong also, I entertain no doubt, to *Dammara*. They are varyingly oval and lineal-lanceolate, narrowing upwards to a short sometimes obtuse apex, and downwards to the short and thick petiole. The lamina is thinly striate along its length; a middle rib is wanting, but the stripes are not quite equally thin (see Fig. 35A, magnified). Doubtless the leaves figured here, though varying in some degree in size and form, belong to one and the same species, being united by some transitory forms. The smallest leaf, Fig. 34, is fifty-seven millimeters long and 12 millimeters broad. We find similar leaves in *Dammara robusta*, Moore, which have also a short petiole. Respecting the scales of the cone which are smaller than those of the species named, our species agrees more with *Dammara australis*, Lamb., their leaves, however, being unpetiolate, and scarcely reach the above-mentioned size. Both the species mentioned are living in Australia, and the fossil, intermediate in its character, may be their ancestor.

DAMMARA PODOZAMIOIDES, *sp. nov.*

Plate VIII, Figs. 39, 40.

Sp. Char.—D. foliis rigide coriaceis, lineari-lanceolatis, utrinque angustatis, basi in petiolum crassum attenuatis, tenuiter striatis.

Obs.—Differs from the preceding species by narrower and longer leaves, a thicker petiole and a more thinly striate lamina; further, from other similar Cycadaceous leaves, for instance *Podozamia*, by the peculiar type of nervation, seen in the broad-leafed coniferæ.

Locality and Horizon.—Old Rose Valley Lead, with preceding.

TAXINEÆ.

PODOCARPUS PRÆCUPRESSINA, *sp. nov.*

Plate VIII, Figs. 25–27.

Sp. Char.—P. ramulis gracilibus, foliis parvis, basi decurrentibus, ramorum juniorum distichis, patulis, curvulis, subfalcatis, linearibus obtusiusculis, mucronulatis, seniorum brevioribus adpressis lanceolatis; nervo mediano distincto; fructibus solitariis globoso-ovatis, lævibus, receptaculo longioribus.

Obs.—The branchlets, Figs. 26 and 27, show a rather tender rachis, and in connection with it, lineal, rigid, coriaceous leaves. They are close together, distichous, obtusely pointed, flat, a little falsiform, narrowed and decurrent at base, and bear a strong middle nerve (see Figs. 26A and 27A, magnified). The branchlets described are certainly the younger, or secondary ones. But Fig. 25 shows a branchlet with a smaller number of leaves, usually shorter and less distant. This, also bearing fruit, is an older or primary one. Besides, there are in the collection before me some other branchlets not figured, their leaves being still smaller and shorter, at greater and unequal distances, and converging more to the rachis. The above-mentioned fruit, a small berry, growing solitary on the top of a forked branchlet, is globular-oval, smooth, and surrounded at its base by a cup pressed to it. A fragment of such a one is to be seen on the top of the other twig of the fork, which has already lost its fruit.

The above characters tend to prove a *Podocarpus* of the tribe *Dacrycarpus*, where *P. cupressina*, R. Brown, living in Oceania, offers the nearest likeness. Among the fossil species *Podocarpus elegans*, De la Harpe, from the British Eocene, is closely allied to our species. The former, of which the fruit is still unknown,* differs from the latter by the size and arrangement of the leaves, which are greater and more distant.

A predecessor of the *Podocarpus præcupressina* has been found in the Cretaceous Flora of New Zealand, which will be described in my paper upon this Flora (Denksch. K. Akad. Wissensch. Wien, 1887). It may therefore be stated that the tribe *Dacrycarpus* had at an early period a larger area of distribution in the South Hemisphere.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay under basalt.

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*In the Monograph of the British Eocene Flora, vol. ii, Part I (Palæontographical Society, vol. for 1883), there is figured Plate VIII, fig. 16, a branchlet of *Podocarpus elegans*, De la Harpe, wrongly identified in connection with a berry of another plant, perhaps a *Laurinea*, accidentally laying close by. I have seen the original in the collection of Mr. J. S. Gardiner.

DACRYDIUM CUPRESSINOIDES, *sp. nov.*

Plate VIII, Figs. 23, 24.

Sp. Char.—D. ramulis gracilibus, foliis parvis falcato-curvatis, basi decurrentibus, crassiusculis carinatisque lineari-lanceolatis, congestis, squarroso-patentibus vel abbreviatis et paullo latioribus, plus minusve imbricatis.

Obs.—I have had only small fragments of branchlets under examination. Their rachis is slender, their leaves are small, short, thick, somewhat falsiform, erect, decurrent, and close together. These fossils show a great likeness to branchlets of *Dacrydium cupressinum*, Sol., living in New Zealand. I have seen more completely preserved remains of another fossil species of *Dacrydium* in the rich collection of New Zealand tertiary plants, sent to me by [the late Sir] J. von Haast. This species is still more closely allied to the living species. Not only its branchlets are strikingly slender, but also the leaves are narrower, more subulate, and thus both more alike the corresponding part of *Dacrydium cupressinum.* This New Zealand tertiary plant must therefore be considered the very predecessor of the living form, and I have called it *Dacrydium præcupressinum* (published in the above-mentioned Memoirs). It is most remarkably that I should discover the ancestor of the latter species in the Cretaceous Flora of New Zealand, which I have called *Dacrydinium cupressinum* (published *ibidem*), and that the Australian Tertiary species is intermediate between the named Cretaceous and the Tertiary species of New Zealand.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay under basalt. Watson's Starlight Claim, Tingha; carbonaceous clay, from Deep Lead (stanniferous) under basalt.

Genus PALÆOCLADUS.

Gen. Char.—Ramuli primarii et secundarii phyllodinei, inter se connati, phyllodia composita lobata formantes. Phyllodia secundaria integra, apice spinulosa. Folia minuta, crassiuscula, parva, disticha, appressa.

PALÆOCLADUS CUNEIFORMIS, *sp. nov.*

Plate VII, Figs. 33, 33A.

Sp. Char.—P. phyllodiis (primariis) oblongo-cuneatis, lobatis lobis (phyllodiis secundariis) breviter ovatis, integerrimis acutis, apice spinula brevissima terminatis; foliis minutis, squamæformibus, ovato-oblongis; nervatione phyllodii compositi craspedodroma; nervo primario (s. axi phyllodii primarii) distincto recto excurrente; nervis secundariis sub angulo acutissimo egredientibus, simplicibus, apicem loborum attingentibus.

Obs.—We have here a phyllodium, which reminds us much of *Phyllocladus.* But there are so many peculiarities respecting formation and form of the phyllodium, as well as the arrangement of leaves, that we have been compelled to suppose here the existence of a separate genus. In *Phyllocladus* the secondary branchlets only are phyllodineous-formed. The phyllodia, unpetiolate, or in connection with the primary branchlets by a short petiole, are there pinnately divided or lobed, and the lobes mostly toothed. The leaves there are small, tender, scale-like, placed in a spiral order or singly near the base of the verticillate primary branchlets. In *Palæocladus,* however, the primary branchlets are phyllodineous, and the secondary ones are reduced to simple and entire lobes. Here we have, accordingly, the remarkable fact of the connection of all phyllodia together. The leaves, though very small, betray a coriaceous texture, and exhibit at the base of the primary phyllodium a distichous order.

The branchlet before us, Fig. 33, presents a phyllodium, on the top of which a second smaller phyllodium is developed, a feature which is wanting in *Phyllocladus,* as the phyllodia in this bear no terminal bud.

Besides these very remarkable characters, forcing a separation of the genus *Phyllocladus,* the following should be distinguished:—The primary phyllodium is elongate-cuneate; its primary nerve is tolerably thick, straight, gaining the top; the second phyllodia, only represented by lobes, are ovate, narrowed to the base or broad-ovate, and acute. The apex of the lobes is marked with a very small spinula (see Fig. 33A, magnified), but not preserved on every lobe. The nerves of the lobes, or the secondary nerves of the compound phyllodium, spring from under very acute angles, and reach the apex of the lobes undivided. The scale-like leaves, only preserved on the larger phyllodium, are somewhat thick and oval-oblong. The upper phyllodium shows at its base some traces of such leaves, equal in form, size, and order, and seen in our figure.

According to its more simple characters, the genus *Palæocladus* may be considered the ancestor of *Phyllocladus.*

Locality and Horizon.—Old Rose Valley Lead, with preceding.

GINKGOCLADUS AUSTRALIENSIS, *sp. nov.*

Plate 8, Fig. 32.

Sp. Char.—G. phyllodiis subcoriaceis, oblongo-cuneatis, basi inæqualibus, apice subtruncatis, margine inciso-dentatis; nervo primario basi prominente; nervis secundariis et tertiariis angulis acutissimis insertis, simplicibus vel furcatis, craspedodromis.

Obs.—This species is closely related to *Ginkgocladus novæ-zeelandiæ,* from the Fossil Flora of New Zealand. The genus *Ginkgocladus* is characterised by its tender phyllodia, being scarcely coriaceous, and not divided or compound. They show thin nerves, being simple or forked, partly in a flabelliform, partly in a penniform nervation. In reference to this texture and nervation, the genus named reminds us of *Ginkgo,* and the analogy to the latter is still more heightened by the long petiole, being preserved only on the New Zealand fossil. Relating to the pinnatiform nervation, our genus is nearly related to *Phyllocladus.*

The specimen before us exhibits all the characters of *Ginkgocladus,* the broken off petiole excepted. But it differs from the New Zealand fossil by the form of the phyllodium, being more cuneate and deeply serrate at its truncate apex.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from the Newer Leads (stanniferous).

PHYLLOCLADUS ASPLENIOIDES, *sp. nov.*

Plate VIII, Figs. 28–31.

Sp. Char.—P. ramulis secundariis distiche alternis, rarius oppositis phyllodineis, phyllodiis rigide coriaceis ex plurium phyllodiorum conjunctione formatis, rhomboideis vel rhomboideo-oblongis vel lanceolatis, lobatis vel pinnatisectis, lobis ovatis vel rotundatis, obtusis, crenulatis vel subdentatis; nervatione flabellata; nervo primario basi subprominente, apicem versus dissoluto; nervis secundariis et tertiariis angulis acutissimis insertis, simplicibus vel furcatis craspedodromis; foliis parvis setaceis; fructibus solitariis ovato-orbicularibus, compressis, apice perviis, semen cingentibus.

Obs.—One might be easily misled by the striking *Asplenium*-likeness of the fossils represented by Figs. 28, 30, and 31, all undoubtedly belonging to the same species, and take them for remains of a fern. But it becomes evident, on close examination, that they are phyllodia of a *Phyllocladus*. Their thick, stiff substance, indicated by a comparatively thick stratum of coal, to be seen in Fig. 28, already evokes considerable doubt as to their resemblance to an *Asplenium*. But a close investigation of the rachis of the figured specimens casts much light upon their very nature, there being scars of branchlets visible, as well as small edges, decurrent from them (Fig. 28), and even now and then small scale-like leaves (Fig. 30A, B). It results from these facts, that the rachis mentioned is not that of a leaf, but of a branchlet, and at once, that the parts to which they belong must be considered phyllodia. But the most important fact proving not only this, but also that the described fossil may safely be referred to *Phyllocladus*, is seen in the specimen Fig. 29, showing a *Phyllocladus*-like fruit connected with the base of the phyllodium.*

At the present time there exist three species of *Phyllocladus*, all confined to the Southern Hemisphere, namely, one (*P. rhomboidalis*, Rich.), in Tasmania, a second (*P. trichomanoides*, Don.) in New Zealand, and a third (*P. hypophylla*, Hook.) in Borneo. Our fossil *Phyllocladus*, when compared with the existing species named, as far as our means of comparison extend, unites the principal characters of these species. It shows, firstly, a character common to all; and, secondly, such as are due to the single species. The phyllodia are distichous, the nervation is flabelli-penniform (Figs. 30A and 31A, magnified), with simple or forked secondary and tertiary nerves, diverging at very acute angles, the fruit being open on its apex. These characters are like those of all *Phyllocladi*. But the phyllodia are rhomboidal (Fig. 30) like those of *P. rhomboidalis*, and also narrow, oblong, or lanceolate (Fig. 28), like those of *P. hypophylla*; they are lobed, or pinnately dissected, like those of *P. trichomanoides*; the lobes are obtuse, and their borders minutely teethed, like those of *P. hypophylla*; finally these leaves are like those of *P. trichomanoides*. It is to be stated, that the fossil species differs from all the living ones named by their larger primary and secondary branchlets.

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* It is worthy of remark that as the fossils of Vegetable Creek are very often stained by oxide of iron, those of the specimens referred to *Phyllocladus asplenioides*, being more or less covered with the oxide, especially on the nerves (see figs. 30 and 32A), assume a likeness to a fern, for instance, to an *Asplenium* bearing fructification. Those not acquainted with the fact might erroneously be led to conclude that this sori-like coating belongs to *Asplenium*.

The abovementioned fruit, berry-like, is somewhat larger than that of the present species, and betrays a remarkable likeness to that of *Phyllocladites rotundifolia*, Heer, from the Cretaceous Flora of the Arctic Regions; but the formation of the phyllodium of the latter is different.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead (stanniferous), on the main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

MONOCOTYLEDONES.

GRAMINEÆ.

POACITES AUSTRALIS, *sp. nov.*

Plate IX, Figs. 2, 2A.

Sp. Char.—P. foliis linearibus, integerrimis, 4^{mm} latis, nervis longitudinalibus primariis 9, tenuibus æqualibus, cum nervis interstitialibus solitariis tenuissimis alternantibus.

Obs.—A small fragment of a Graminaceous leaf, which can only be provisionally named now, till more complete remains, found at a future time, may render it possible to gain a closer determination of the species. The leaf was lineal, entire, and of a membranaceous texture. It shows nine equally thin longitudinal nerves, the exterior of them close to the borders. These primary nerves alternate with very thin intermedial ones (see fig. 2A, enlarged).

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

BAMBUSITES ARTHROSTYLINUS, *sp. nov.*

Plate IX, Figs. 1, 1A.

Sp. Char.—B. foliis lancelato-linearibus, basi subito angustatis, apice acuminatis, integerrimis, nervis primariis pluribus tenuissimis, vix conspicuis, mediano basi prominente.

Obs.—The leaf is 5 millimeters broad, and when completed, 35 millimeters long, shortly narrowed at base and there, as may be conjectured, rounded and petiolate, but gradually narrowed towards the apex, untoothed at the borders. A middle nerve is distinguishable only at the base and somewhat upwards. Some other longitudinal nerves, being extremely thin, equal and close to one another, are only visible through a strong glass (see fig. 1A, enlarged, taken from the midst of the lamina). The texture of the leaf seems to have been somewhat thick, although not coriaceous. The fossil reminds us much of the leaves of some Gramineæ of the type of *Bambusa*, especially *Arthrostylidium Trinii*, Rupr., of the Brazilian Flora.

Locality and Horizon.—Old Rose Valley Lead, with the preceding. Gem Lead (stanniferous), under basalt, Rocky Creek, near Emmaville (Vegetable Creek Township).

DICOTYLEDONES.

Apetalæ.

PIPERACEÆ.

PIPER FEISTMANTLII, *sp. nov.*

Plate IX, Fig. 4.

Sp. Char.—P. foliis subcoriaceis, e basi subcordata ovatis apice breviter acuminatis, margine integerrimis; nervatione subactinodroma; nervis primariis 5, medio, prominente recto, apicem versus attenuato, excurrenti, lateralibus internis arcuatis, laminæ dimidium attingentibus, angulo 45° divergentibus, externis abbreviatis parum evolutis vix conspicuis; nervis secundariis paucis sub angulis 60–65° orientibus, tenuibus arcuatis; nervis tertiariis numerosis, ramosis prominentibus, inter se conjunctis, reticulum laxum formantibus.

Obs.—A well-preserved fossil leaf, the base of which, though in some degree mutilated, fortunately allows one easily to complete its figure. The fossil betrays a firmer, nearly coriaceous texture. The presence of a petiole is to be conjectured from the almost cordate base. The lamina is 9 centimeters in length, and nearly 6 centimeters in breadth. The apex is somewhat protruding, the margin entire or a little undulate. The nervation is imperfectly actinodrome. Three of the five primary nerves are entirely developed, the middle of the latter is stronger, both extremes being very short, and scarcely visible without a glass. A few secondary nerves spring from the middle nerve; a greater number of them, however, from the outer side of the basilar nerves under less acute angles. The tertiary nerves are comparatively strong, prominent, and united to a lax network.

The fossil described is referable to the leaf of *Piper excelsum*, Forst., inhabiting New Zealand. Its reference to *Piper antiquum*, Heer, from the Tertiary Flora of Sumatra, might also be noticed; but this species differs from the Australian by its perfect actinodrome nervation.

Locality and Horizon.—Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

CASUARINEÆ.

CASUARINA COOKII, *sp. nov.*

Plate 9, Figs. 3, 3A.

Sp. Shar.—C. ramulis ultimis tenuissimis, strictis, simplicibus, tetragonis, internodiis, 4^{mm} longis, vaginarum dentibus 4, brævi-ovatis, acutis, appressis.

Obs.—A very thin *Casurina* branchlet is represented by Fig. 3 of the natural size, and Fig. 3A magnified. Its diameter is scarcely 1 millimeter long, and four-edged. The internodes are short, the sheaths four-teethed, adpressed, their teeth short, oval, acuminate. This branchlet bears a close resemblance to those of *Casuarina sotzkiana (Ephedrites,* Unger, Foss, Flora von Sotzka, Pl. XXVI, fig 5). The latter likewise shows very thin branchlets, with four-teethed sheaths. But the branchlets are somewhat cylindrical, the internodes 8–10 millimeters long, and the teeth of the sheaths lanceolate, standing off.

Very similar to the one above described is a second species, namely, *Casuarina padangiana*, Heer, from the Tertiary Flora of Sumatra. In the latter the branchlets are four-edged, like those of *Casuarina Cookii*, while its articulations and teeth of the sheaths are like those of *C. sotzkiana.*

Amongst living species, I consider *Casuarina Decaisneana*, F. Muell., to be nearest related to *C. Cookii.* The former *Casuarina* belongs to the few species characterised by four-edged branchlets and four-toothed sheaths, differing, however, from our species by longer internodes.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead (stanniferous) on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

MYRICEÆ.

Myrica Konincki, *sp. nov.*

Plate IX, Figs. 6, 7.

Sp. Char.—M. fructibus globosis granulosis, foliis membranaceis oblongis vel obovato-oblongis, basi attenuatis, apice rotundato-obtusis, margine serratis; nervatione camptodroma; nervo primario prominente, recto, apicem versus valde attenuato; nervis secundariis angulis subrectis egredientibus, tenuibus; nervis tertiariis sparsis tenuissimis dictyodromis.

Obs.—The leaf is oblong or cuneate-ovate, membranaceous, narrowed to the base, on the less narrowed apex roundly obtuse; the borders minutely serrate. The camptodrome nervation shows a pretty strong primary nerve, some thin secondary nerves proceeding from each side of the latter under scarcely acute or nearly right angles. The tertiary nerves are very thin, and taking their rise from the outer side of the secondary at acute angles, pass into a network, consisting of thin meshes, which resembles very much that of a *Myrica*. I am of opinion that the described fossil might belong to the latter genus, as a series of fossil leaves of *Myrica* betray a more or less striking likeness to it. It seems especially to be closely related to *Myrica deperdita*, Ung., departing from it only by its teeth, which are smaller and begin lower on the margin.

An important fact as affirming the existence of the genus *Myrica* in the Tertiary Flora of Australia is that a fruit (Fig. 7) has been found bearing all the characters of that genus, especially by its globular shape and finely granulous surface.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale in Newer Lead (stanniferous) under basalt. Newstead, near Elsmore, in concretionary ironstone (earthy limonite), associated with basalt.

Myrica pseudosalix, *sp. nov.*

Plate IX, Figs. 5, 5a.

Sp. Char.—M. foliis subcoriaceis, oblongo-ovatis, basi in petiolum angustatis, apice obtusis, integerrimis; nervatione camptodroma; nervo primario distincto, recto; nervis secundariis approximatis, tenuibus, sub angulo acuto orientibus, tertiariis ramosis dictyodromis.

Obs.—The substance of the leaf is firmer than that of the preceding species; the borders are entire, the secondary nerves closer to one another, the tertiary nerves more distant and dictyodrome. In the other qualities of the leaf, especially of the network (Fig. 5A, magnified), the present fossil agrees with it, and likewise bears the type of a *Myrica* leaf.

Of the already described fossil species, *Myrica salicina*, Ung., is an analogous one.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay below basalt.

BETULACEÆ.

ALNUS MACCOYI, *sp. nov.*

Plate IX, Figs. 8, 9, 22, and 22A.

Sp. Char.—A. foliis petiolatis, latiusculis, ovato-oblongis, duplicato-dentatis; nervatione craspedodroma; nervo primario prominente; nervis secundariis sub angulis 40–50° orientibus, rectis, ante marginem vix sursum curvatis, simplicibus; nervis tertiariis tenuibus rectangularibus, inter se conjunctis.

Obs.—In the first part of these Contributions, I have proved the existence of the genus *Alnus* in the Tertiary Flora of Australia by the determination of its cone-like fruit and leaves. As no other genus of the Vegetable Kingdom is known exhibiting a fructification and leaves like *Alnus*, it would only be a useless attempt to class these fossils in any other family.

Fortunately there have been collected at Elsmore and Vegetable Creek leaves and fruits which I can only declare as belonging to *Alnus*, but to another species. While the above indicated *Alnus Muelleri* is closer related to *A. gracilis* or *A. cycladum*, the leaves found at Elsmore (of these, only one is figured, Fig. 9) come, respecting their qualities and size, much nearer to *Alnus Kefersteinii*, Goepp. The described species is still characterised by a longer leaf and by its secondary nerves being straight or scarcely bent towards the borders. In Fig. 8, a smaller leaf from Vegetable Creek is figured, showing the double-toothed margin and the nervation (Fig. 8A, magnified), both well preserved.

In the strata of Vegetable Creek fruits have been found (Fig. 22, Fig. 22A magnified) very much resembling those which I have collected at Schoenegg in Styria (Austria). They are very small, rounded, flat, and surrounded by a narrow and very thinly membranaceous wing, and show all the characters appertaining to the single fruits of an *Alnus*.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from the Newer Leads (stanniferous) below basalt. Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

CUPULIFERÆ.

QUERCUS WILKINSONI, *sp. nov.*

Plate IX, Figs. 16, 16A.

Sp. Char.—Q. foliis coriaceis firmis, petiolatis, lanceolatis, basi obtusis, apicem versus angustatis, margine incrassato integerrimis; nervatione brochidodroma; nervo primario valido, recto; nervis secundariis subangulis 60–65° orientibus, numerosis, distinctis subflexuosis, ramosis; nervis tertiariis e primario angulis subrectis, e secundariis angulis acutis exeuntibus, ramosis, inter se conjunctis rete; macrosynammatum prominens formantibus, maculis reticulo tenerrimo instructis.

Obs.—An extremely well-preserved fossil, from Vegetable Creek, showing the under surface of the leaf, and exhibiting thereon, when examined through a strong glass, even traces of the epidermis cells. The leaf bears a comparatively short (6 millimeter long) petiole; the lanceolate lamina is very little narrowed at base, but much more gradually so towards the apex. The borders are somewhat thickened. The consistence of the leaf is coriaceous and stiff. The numerous secondary nerves, being curved and rather flexuous, are anastomosing before the margin. The tertiary nerves proceed from the primary in every secondary segment, two or three at nearly right angles. One of these is stronger, and often transforms into a short secondary nerve. The other tertiary nerves diverge from the outer side of the secondary at acute angles, and anastomose, thus forming a tolerably strong network. The latter is filled out by a very fine net of the quaternary and quinternary nerves (see Fig. 16A, enlarged).

The determination of the genus to which this fossil belongs presents no difficulties at all, although no species of the present Flora betrays a striking and exclusive similarity to it. On the contrary, it unites the characters of several species of *Quercus*. It closely resembles *Quercus virens*, Ait., respecting the form and consistence of the leaf; *Quercus sapotæfolia*, Lieb., respecting the nervation, especially the characters of the secondary and tertiary nerves, and of the network, and *Quercus imbricaria*, Michx., in the same respect, especially of the angles of divergence of the mentioned nerves, although the latter species differs much from the fossil one by its thinner leaves being deciduous. Finally, *Quercus acutifolia*, Née, *Q. Humboldtii*, Bonpl., and *Q. tolimensis*, H. B. K., may be mentioned as species similar to the fossil, respecting the form, texture, nervation, and other qualities of the leaves. It is remarkable that all known species analogous to *Quercus Wilkinsoni*, are American.

Of the fossil species *Quercus chlorophylla*, Ung., is the nearest related to *Q. Wilkinsoni*, but the latter possesses stronger secondary and tertiary nerves than the former. A remarkable, although more distant analogy to our species is *Quercus cineroides*, Lesq., of the American Tertiary Flora.

Locality and Horizon.—Watson's Starlight Claim, Tingha; carbonaceous clay, in a Deep Lead (stanniferous), under basalt. Vegetable Creek.

QUERCUS GREYI, *sp. nov.*

Plate IX, Fig. 10.

Sp. Char.—Q. foliis coriaceis firmis, anguste lanceolatis, basin versus longe attenuatis, margine incrassato integerrimis; nervatione brochidodroma; nervo primario prominente; nervis secundariis subangulis 65–70° orientibus, numerosis, flexuosis, ramosis; nervis tertiariis e primario subangulo recto, e secundariis subangulis acutis exeuntibus, ramosis, inter se conjunctis; rete macrosynammatum formantibus, maculis reticulo tenerrimo instructis.

Obs.—This species is closely allied to the preceding one, but differs from it by smaller, lineal-lanceolate leaves, gradually narrowed towards the base. It corresponds to *Quercus elæna*, Ung.

Locality and Horizon.—Between Hall and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

QUERCUS AUSTINI, *sp. nov.*

Plate IX, Figs. 11, 12.

Sp. Char.—Q. foliis coriaceis, breviter petiolatis lineari-lanceolatis, basi acutis, apicem versus angustatis, margine integerrimis, rarius denticulatis, subtus tomentosis (?); nervatione brochidodroma; nervo primario prominente; nervis secundariis subangulis 70–80° orientibus, numerosis, parallelis, curvatis, ramosis; nervis tertiariis parce evolutis et vix conspicuis.

Obs.—Differs from both the preceding species by much smaller and narrower leaves, exhibiting slightly developed tertiary nerves. The borders are sometimes minutely toothed. The fossil leaves show their under surface, which may have been covered by a felt, like the leaves of the much analogous *Quercus mexicana*, Humb. et Bonpl.

Of the fossil species hitherto described, ours is related to *Quercus myrtilloides*, Ung.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay under basalt.

QUERCUS HARTOGI, *sp. nov.*

Plate IX, Fig. 19.

Sp. Char.—Q. foliis coriaceis, petiolatis, lanceolatis, basi rotundatis, apicem versus angustatis, margine grosse spinuloso-dentatis; nervatione mixta, in parte inferiore plerumque camptodroma, in superiore craspedodroma; nervo primario valido, recto prominente apicem versus attenuato; nervis secundariis fere tenuibus, subangulis 40–50° orientibus, numerosis arcuatis subflexuosis apice ramosis, ramulis sæpe in spinulas dentium exeuntibus; nervis tertiariis tenuibus, latere externo angulo acuto exeuntibus, ramosissimis, reticulum distinctum formantibus.

Obs.—The leaf is like that of *Quercus drymejoides*, Ett., from the Dalton beds (see Part I), as regards its toothed borders and form; but it differs from the latter by a roundish base, and a compound type of nervation. The secondary nerves are comparatively thin, more bent and branched at their ends. Their branchlets, running sometimes to the teeth, form a spinula. The tertiary nerves are thin, and diverging from the outer side of the secondary ones at acute angles, branch into a rather prominent network.

The relationship of this species is the same as that of *Quercus drymejoides;* having already pointed out that of the latter I only now refer to it.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), Vegetable Creek Main Deep Lead; brown carbonaceous clay under basalt.

QUERCUS HAPALONEURON, *sp. nov.*

Plate IX, Figs. 20, 21.

Sp. Char.—Q. foliis subcoriaceis, petiolatis lanceolatis, basi angustatis, apicem versus acuminatis, margine dentatis; nervatione craspedodroma; nervo primario prominente, recto, apicem, versus attenuato, excurrente; nervis secundariis distinctis, fere tenuibus, subangulis 30–40° orientibus, numerosis, rectis simplicibus; nervis tetiariis tenuissimis numerossimis, approximatis, parallelis, angulo subrecto insertis, furcatis, inter se conjunctis, reticulum tenerrimum formantibus.

Obs.—This species much resembles the following one in respect to the form and nervation of the leaf. But it differs from it by a more narrowed base, being nearly protruded, and by the presence of numerous tertiary nerves, which are closer and parallel to one another (see the nervation enlarged, Fig. 20A). From the preceding species the present fossil deviates by just the same qualities and still more by its straight, simple secondary nerves, and by an otherwise toothed margin.

Of the living species of *Quercus* I have especially to name *Q. glauca*, Thunb., from Japan, as exhibiting a striking leaf-likeness to the fossil, respecting its very fine tertiary nerves being close to one another, and its tender network; and *Q. Libani*, Oliv. (see these Contributions, Part I, Pl. VII, fig. 7), respecting its secondary nerves being straight, parallel to one another, and diverging at pretty acute angles.

Locality and Horizon.—Old Rose Valley Lead, with many of the preceding species.

QUERCUS DARWINII, *mihi.*

Plate IX, Figs. 18, 18A.

Ettingshausen, Beiträge z. Tertiärflora Australiens, I, *loc. cit.*, p. 118, Plate II, fig. 3.

Sp. Char.—Q. foliis subcoriaceis, lanceolatis, acuminatis, basi acutis integerrimis, reliquo margine dentatis; nervatione craspedodroma; nervo primario recto, basi valido, apicem versus angustato; nervis secundariis distinctis, subangulis 40–50° orientibus, approximatis, leviter curvatis, apicem versus abbrevatis et subrectis; nervis tertiariis tenuissimis ramosis, reticulum tenerrimum formantibus.

Obs.—A leaf of this species, Fig. 18, has been collected at Vegetable Creek. It is smaller than that from Dalton, already described by me, but its nervation is better preserved. The latter, represented in Fig. 18A (magnified), exhibits a tender network of the tertiary nerves. As for the other characters of the leaf, especially the form, margin, and nerves, as far as they are comparable, the present leaf agrees well with that from Dalton. Another specimen I refer to this species has been found at Elsmore.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead. Dalton, near Gunning; in hard siliceous grit, reposing on Silurian rocks. Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

QUERCUS EDELII, *sp. nov.*

Plate IX, Figs. 13, 13A.

Sp. Char.—Q. foliis subcoriaceis, obovato-oblongis, apice obtusis, margine grosse dentatis; nervatione brochidodroma; nervo primario firmo, recto, excurrente; nervis secundariis tenuibus, angulo subrecto egredientibus, ramosis, ramorum laqueis pluriseriatis, vix prominentibus; nervis tertiariis tenuissimis, dictyodromis.

Obs.—This species is closely allied to *Quercus serra*, Ung., of the Fossil Flora of Parschlug, in Styria, Austria. The form of the leaf, the peculiarly toothed borders, and the type of nervation are nearly the same in both species. The Australian one only differs by its thinner secondary nerves and their more obtuse angles of divergence (see the network of *Quercus Edelii*, Fig. 13A, in comparison with that of *Q. serra*, Fig. 14A, both magnified).

Locality and Horizon.—Witherden's Tunnel, with the preceding species.

QUERCUS DAMPIERI, *sp nov.*

Plate IX, Figs. 15, 15A.

Sp. Char.—Q. foliis coriaceis, petiolatis oblongo-lanceolatis, remote dentatis, basi attenuatis, apice paullo angustatis; nervatione craspedodroma;

nervo primario valido, recto, apicem versus attenuato, excurrente; nervis secundariis distinctis, fere prominentibus, subangulis 70–80° orientibus numerosis, arcuatis, simplicibus vel apice ramosis; nervis tertiariis angulo subrecto exeuntibus, ramosis; reticulo valde evoluto.

Obs.—This leaf one might consider, on only superficial examination, as having much likeness to that of *Myrica lignitum* and to that of the allied living *M. cerifera*, Linn. But on closer examination it becomes the more evident that it cannot belong to a *Myrica*, as its texture is rigid and coriaceous and its nervation shows all the properties of *Quercus*. The primary nerve is strong; the secondary nerves being curved are rather strong; the tertiary ones, diverging nearly at right angles, are branched and united to one another; the network, enlarged in Fig. 15A, agrees most with that of *Quercus*.

The comparison of the fossil with the present species leads perceptibly to those of Asia with oblong or oblanceolate leaves, being narrowed to the petiole and coriaceous. Among these *Quercus Hancei*, Benth., from the Isle of Hongkong, bears leaves, which show a nervation and other qualities very similar to the fossil, excepting that the base is less narrowed and the margin entire.

Of the *Quercus* of the European Tertiary, *Quercus Hamadryadum*, Ung., *Q. Orionis*, Heer, and *Q. argute-serrata*, Heer, agree more or less with the Australian one here described, especially respecting the form and partly, also, the texture. But they differ by some peculiarities of the nervation and by the teeth of the margin.

Locality and Horizon.—Witherden's Tunnel, with the preceding species.

QUERCUS BLAMINGII, *sp. nov.*

Plate IX, Figs. 17, 17A.

Sp. Char.—Q. foliis coriaceis, ovato-oblongis, acuminatis, denticulatis; nervatione craspedodroma; nervo primario firmo, recto, excurrente; nervis secundariis distinctis, subangulis 70–80° orientibus, numerosis approximatis, arcuatis, apicem versus abbreviatis; nervis tertiariis tenuissimis, latere externo angulis acutis egredientibus, simplicibus vel ramosis, reticulum tenerrimum valde evolutum includentibus.

Obs.—This species is allied, as regards the formation of the leaf, to the preceding ones, from which it is distinguished as follows:—The form is broader, the borders are finely teethed, the teeth directed upwards, and somewhat approaching to one another; the secondary nerves being less curved, depart under less acute angles. The tertiary nerves, diverging from the outer side of the former under acute angles, are very fine and anastomosing, enveloping a much developed network, which consists of minutely quadratic meshes (see Fig. 17A, enlarged).

Our species approaches nearest in the above characters with *Quercus Eyrei*, Benth., from Hongkong, the latter species only differing from it by less toothed borders.

Locality and Horizon.—Old Rose Valley Lead, with several of the preceding species.

DRYOPHYLLUM HOWITTI, *sp. nov.*

Plate X, Figs. 1, 1A and 1B.

Sp. Char.—D. foliis coriaceis, oblongis, basi breviter petiolata subcordatis, margine calloso-dentatis, dentibus obtuissimis; nervatione craspedodroma; nervo primario prominente recto, apicem versus attenuato; nervis secundariis distinctis, sub angulis 40–45° orientibus numerosis approximatis, rectis, apice furcatis, ramis in dentes terminantibus, superiore elongato nervum marginalem formante, inferiore brevissimo; nervis tertiariis tenuissimus, rectangularibus, approximatis, simplicibus vel furcatis, inter se conjunctis, recticulum tenerrimum formantibus.

Obs.—The leaf represented in Fig. 1 shows the type of nervation of a *Dryophyllum*, but without being closely related to any of the hitherto known species of the genus. The consistence of the leaf is coriaceous. The base of the oblong lamina is emarginate, or almost cordate, and shortly petiolate. The borders are toothed, the teeth obtuse, nearly rounded, and thickened. The secondary nerves are thin, but somewhat prominent, approaching and parallel to one another, straight, forked once just before each tooth-sinus of the margin. The branchlets of the folk, although being very unequal in length, reach the next two teeth as seen in Fig. 1B (magnified). The tertiary nerves proceeding from both sides of the secondary ones at right angles, are very fine and anastomosing. The quaternary nerves diverge from the latter at the same angle; the meshes of the network, therefore, being mostly rectangular (see Fig. 1B, enlarged). As analogous to this species one may consider *Dryophyllum subcretaceum*, Sap., and *D. subfalcatum*, Sap.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

FAGUS CELASTRIFOLIA, *sp. nov.*

Plate X, Figs. 2, 2A.

Sp. Char.—F. foliis coriaceis, breviter petiolatis, obovato-ellipticis, basi angustatis, apice obtusiusculis, margine antico dentatis; nervatione craspedodroma; nervo primario basi prominente, apicem versus subflexuoso secondariis paucis, subangulis acutissimis orientibus, subrectis simplicibus; nervis tertiariis tenuissimis rectangularibus vix conspicuis.

Obs.—A small coriaceous leaf, which at first sight reminds us of a *Celastrus*, especially relating to its size and form. But a close examination leads us to another determination, as the secondary nerves are craspedodrome, a character foreign to the genus named. The lamina of the leaf is elliptical, somewhat transitional to an obovate form, narrowed to a short petiole, and at the apex roundedly obtuse. The borders are unequally toothed, the teeth near the apex being larger and approximate, but those nearer the base very small, obtuse, and distant, the base itself being nondentate. The primary nerve, only prominent at the base, is somewhat flexuose in its course from the middle towards the apex. The secondary nerves diverge from the latter at an angle of 20° to 30°, being straight and undivided, mostly reaching the margin. The tertiary nerves preserved only on a few spots of the leaf, come from the secondary ones at less than a right angle. (See the enlarged Fig. 2A.)

I compare the described species to *Fagus fusca*, Hook., at present inhabiting New Zealand. The latter possesses leaves similar to those of the former in size, form and nervation. It must especially be stated that they are coriaceous, ovate or nearly obovate, sometimes elliptical, that their borders are toothed from above the base, the latter being untoothed. And further, respecting their nervation, the primary nerve being thin and somewhat flexuous gives off a few fine and craspedodrome secondary nerves, and these many very fine and rectangular tertiary ones. The only discernible difference between the living species referred to and the fossil, is that the leaves of the former are broader, and their secondary nerves diverge from the primary one at more obtuse angles.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

FAGUS MUELLERI, *sp. nov.*

Plate X, Figs. 3–7, 7A.

Sp. Char.—F. foliis coriaceis, breviter petiolatis, ovatis, rhomboideis ellipticis vel oblongis, basi acutis vel angustatis, apice acuminatis, margine simpliciter, vel inæqualiter vel duplicato-dentatis; nervatione craspedodroma; nervo primario basi vel usque ad dimidium laminæ prominente recto vel paullo fluxuoso; nervis secundariis pluribus, subangulis 40–45° orientibus, rectis simplicibus; nervis tertiariis tenuibus, angulis subrectis egredientibus simplicibus, vel ramosis, reticulum valde evolutum et prominens includentibus.

Obs.—A beautiful species, frequently occurring in the abovenamed locality, and doubtless related to *Fagus Dombeyi*, Mirb., an inhabitant of South Chili at the present time. Two varieties in the form of the leaf should be distinguished here: One possesses ovate or rhomboidal leaves, the other oblong, or almost lanceolate ones. The texture is perfectly coriaceous; the petiole only reaches the length of 3 millimeters. The base is acute, seldom more narrowed, the apex elongate; the borders are unequally or doubly, rarely simply, toothed. The primary nerve on the shorter leaves is only prominent at their base, being more or less flexuose, like that of *Fagus Dombeyi;* while on the longer ones it is straight, stronger, and more prominent. The secondary nerves vary likewise from a thinner to a firmer state of their development, being in the latter case straight and undivided. The tertiary nerves are fine. The network is intensely developed (Fig. 7A magnified), its very small meshes being roundish-angular and prominent, like those of the living species named. A small branchlet, not figured in the plate, shows its leaves to be alternate. The leaf-fossils, Figs. 5, 6, 7, belong to the first-mentioned variety, bearing shorter and smaller leaves, whilst, on the contrary, Fig. 3 belongs to the second, with longer and larger leaves, with the fossil, Fig. 4, and several others not figured here, laying between them.

I named this species in honor of Baron Ferdinand von Mueller, F.R.S., of Melbourne.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek, Main Deep Lead; brown carbonaceous clay, under basalt.

FAGUS HOOKERI, *sp. nov.*

Plate X, Figs. 10–11, 11A.

Sp. Char.—F. foliis submembranaceis, ovatis vel ovato-oblongis, utrinque angustatis, margine duplicato-dentatis; nervatione craspedodroma; nervo primario debili, recto; nervis secundariis pluribus, subangulis 30–40°

orientibus, tenuibus, rectis vel leviter curvatis, simplicibus; nervis tertiariis tenuissimis, ramosis rarius simplicibus, reticulum valde evolutum tenerrimum haud prominens includentibus.

Obs.—This species is intimately allied to the preceding one, but differs from it by the following characters:—The texture is more tender, the borders are doubly toothed, and the teeth are larger. The primary nerve and the secondary ones are comparatively thinner, the network is still more widely developed and its segments somewhat larger, as represented in Fig. 11A, (enlarged). Respecting these characters of the leaf, *Fagus obliqua*, Mirb., from Chili[*] is the nearest analogue of the existing Flora.

I dedicated the fossil species in honor of Sir Joseph D. Hooker, F.R.S., to whom Botany is much indebted for his meritorious works.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

FAGUS BENTHAMI, *sp. nov.*

Plate X, Figs. 8–9, 9A.

Sp. Char.—F. nuculis obtuse triquetris, sublevibus, foliis membranaceis petiolatis, oblongo-ovatis, basi obtusis, apicem versus angustatis, margine inæqualiter vel duplicato-dentatis, nervatione craspedodroma, nervo primario prominente, recto; nervis secundariis pluribus subangulis 45–55° orientibus, distinctis rectis vel basi divergenti-arcuatis, simplicibus; nervis tertiariis tenuissimis, angulo subrecto insertis, fluxuosis, simblicibus vel ramosis inter se conjunctis, reticulo valde evoluto.

Obs.—Closely related on the one hand to *Fagus Feroniæ*, Ung., a species widely spread in the Tertiary Formation; on the other to *F. ferruginea*, Ait., and *F. sylvatica*, Linn., now living. The described species agrees perfectly with *Fagus Feroniæ* respecting form and borders of the leaf, as well as nervation, especially with the variety *F. Deucalionis*, Ung.; but it differs in the formation of the network, as discernible by comparing the magnified Fig. 9A.

Fagus Benthami differs from *F. Wilkinsoni* and *F. risdoniana*,[†] by a more tender texture of the leaf and by its otherwise toothed borders, and especially from the latter species by the tertiary nerves, diverging rectangularly from the secondary ones. Besides these characters, the leaf of *F. Benthami* is distinguished by other characters such as: the petiole reaches 11 millimeters in length; the lamina is somewhat less narrowed towards the base than that of the abovenamed species, and the base itself is almost obtuse. The secondary nerves, distant from one another about 8 millimeters, and are more or less divergingly curved, like those of *F. sylvatica* and *F. ferruginea.*

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[*] *F. australis*, Goepp., in Ettingshausen, Blattskelete der Apetalen, *Denksch. K. Akad. Wissensch. Wien*, *Bd.* xv, Pl. VIII, figs. 3–5.

[†] See pp. 32 and 35.

At Elsmore, a locality remarkable for its fossil fruits, a beech-nut has been found, represented in Fig. 8. As the shape of the nut agrees most with that of the same living species to which the fossil leaf is analogous, I do not doubt that both fruit and leaf belong to one and the same species, which I have named after the late George Bentham, whose merits in describing the Flora of Australia are indeed great.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from the Newer Leads (stanniferous), below basalt. Newstead, near Elsmore; in concretionary ironstone (earthy limonite) associated with basalt.

ULMACEÆ.

Genus—ULMOPHYLLUM.

Gen. Char.—Foliis subæqualibus, argute crenato-dentatis, nervis secundariis craspedodromis numerosis parallelis, nervis tertiariis subtilissimis dictyodromis.

ULMOPHYLLUM OBLONGUM, *sp. nov.*

Plate X, Figs. 12, 12A.

Sp. Char.—U. foliis subcoriaceis, petiolatis, oblongis, basi rotundatis, apice producto paullo angustatis, margine argute et æqualiter crenato-dentatis, dentibus antrorsum versis; nervo primario tenui; nervis secundariis tenuissimis approximatis; nervis tertiariis tenuissimis rectangularibus vix conspicuiis.

Obs.—A leaf which, according to its form and nervation, one might consider an *Ulmus;* but the contrary is proved by its almost coriaceous texture, the teeth being adpressed and turned towards the apex especially, by the tertiary nerves being very fine, short, and disappearing into a narrow-meshed net (Fig. 12A, enlarged). I could not discover any other family than the Ulmaceæ to which it could be referred. As, however, it does not belong to any living genus, I consider it better to class it in an extinct one.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, under basalt.

MOREÆ.

FICUS BURKEI, *sp. nov.*

Plate X, Fig. 13.

Sp. Char.—F. foliis subcoriaceis, petiolatis oblongis, basi angustatis integerrimis; nervatione camptodroma; nervo primario, valido recto; nervis secundariis subangulis 45–55° orientibus, prominentibus apice ramosis inter se conjunctis; nervis tertiariis prominentibus extus subangulis acutis egredientibus simplicibus vel ramosis inter se conjunctis, rete macrosynammatum includentibus.

Obs.—A fossil leaf which is indicated by all its characters as a *Ficus.* The substance must be considered firm, rather coriaceous than membranaceous. The lamina, being rather broad, is narrowed at the base into a strong petiole, from which runs up a strong and straight primary nerve. The secondary nerves are pretty strong, 13 millimeters distant from one another, and curving upwards to the margin anastomose in following the borders. The tertiary nerves are 2–3 millimeters distant from one another, and diverge from the primary one at right angles, and from the outer side of the secondary ones at acute angles, thus running in an almost transverse direction. They enclose a network consisting of lax meshes.

The leaf reminds us of that of *Ficus lanceolata,* Heer, from which it differs only by a less narrowed base and by the tertiary nerves running in another direction.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Lead, Emmaville (Vegetable Creek Township).

FICUS GIDLEYI, *sp. nov.*

Plate X, Figs. 16, 16A.

Sp. Char.—F. foliis coriaceis, lanceolatis integerrimis, apicem versus angustatis; nervatione brochidodroma; nervo primario prominente, recto, excurrente; nervis secundariis prominentibus, sub angulis 40–50°, superioribus subangulis obtusioribus orientibus, arcuatis, segmenta marginem versus angustata formantibus; nervis tertiariis prominentibus, extus angulis acutis egredientibus, ramosis, inter se conjunctis; reticulo microsynammato.

Obs.—Corresponds in some degree to ***Ficus arcinervis***, Heer, the nervation especially, represented in Fig. 16A (magnified), is quite comparable to that of the leaves of the species just named from Sagor, Austria. The form, texture, and the qualities of the secondary nerves and of the network are in both species almost the same. Yet the tertiary nerves of our fossil leaf are more prominent, and their angles of divergence to the secondary ones are more acute than those of the abovenamed species.

FICUS SOLANDERI, *sp. nov.*

Plate X, Figs. 17, 17A.

Sp. Char.—F. foliis coriaceis, petiolatis, ellipticis vel ovato-oblongis, integerrimis, basi obtusiusculis, apice paullo angustatis; nervatione brochidodroma; nervo primario valido prominente, recto; nervis secundariis tenuibus, subangulis 50–65° orientibus, arcuatis, segmenta versus marginem rotundato-obtusa formantibus; nervis tertiariis tenuissimis extus angulis variis egredientibus, ramosis; reticulo microsynammato valde evoluto.

Obs.—Allied to ***Ficus Reusii***, Ett., in regard to its texture, form, and some qualities of the secondary nerves, but differs from that species by a more tender network, and by the basilar secondary nerves being less developed. Our species differs from the preceding one by a shorter leaf, by more obtuse angles, under which the secondary nerves diverge, by the more rounded endings of their segments, and by a more developed network.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

FICUS PHILLIPSII, *sp. nov.*

Plate X, Figs. 18, 18A.

Sp. Char.—F. follis coriaceis, anguste lanceolatis, integerrimis, apice acuminatis; nervatione brochidodroma; nervo primario prominente, recto, excurrente; nervis secundariis tenuibus, subangulis 60–70° orientibus, arcuatis, segmenta versus marginem rotundata formantibus; nervis tertiariis tenuissimis, rectangularibus, ramosis; reticulo microsynammato valde evoluto.

Obs.—Closely allied on the one hand to the preceding species, on the other to *Ficus dalmatica*, Ett., *F. Phillipsii* departs from the first by a longer and narrower leaf by the tertiary nerves arising out of the secondary ones at right angles, and by an otherwise formed net, with its nervules somewhat stronger, and its meshes smaller.

Our species differs from *Ficus dalmatica* and from *F. Reusii* by the same characters as *F. Solanderi* does.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

FICUS WILLSII, *sp. nov.*

Plate X, Figs. 14, 15, 15A.

Sp. Char.—F. foliis coriaceis, ellipticis (?) integerrimis vel undulatis, basiacutis; nervatione camptodroma; nervo primario crasso; nervis secundariis subangulis 75–85° orientibus, paullo arcuatis parallelis; nervis tertiariis tenuissimis angulis variis exeuntibus, ramosis inter se conjunctis; reticulo tenerrimo evoluto.

Obs.—Although this species is only represented by mere fragments of the leaf, a closer investigation suffices to distinguish a species which is closely related to *Ficus Jynx*, Ung. The nervation being well preserved, fortunately admits a comparison with this species. They agree most with smaller leaves of *Ficus Jynx* from Sotzka, as well as with the leaves figured in Heer's Tertiärflora der Schweiz, vol. i, Pl. LXXXV, figs. 8–11. One might even be inclined to suppose the identity of both the Australian and the European species, but this is contradicted by a careful comparison of the network of the first (magnified in Fig. 15A) with that of the second. On *Ficus Jynx* the tertiary nerves branch outwards from the secondary at nearly the same acute angle, whilst on our species these nerves branch at varyingly acute angles from both sides of the secondary ones. The latter case occurs also in some living *Ficus*, for instance, *F. Benjaminea*, the leaves of which, showing a form similar to that of the Australian fossil, possess secondary nerves, which are likewise approximate, parallel to one another, and ascending from the primary one at barely acute angles.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

ARTOCARPEÆ.

ARTOCARPIDIUM GREGORYI, *sp. nov.*

Plate X, Figs. 19, 20.

Sp. Char.—A. foliis coriaceis, integerrimis; nervatione camptodroma; nervo primario pervalido, recto, excurrente; nervis secundariis validis prominentibus, subangulis 50–65° orientibus, valde arcuatis marginem adscendentibus, inter se conjunctis; nervis tertiariis e primario angulo subrecto, e secundariis extus angulis acutis exeuntibus, subtransversis, anastomosantibus.

Obs.—Fig. 20 represents a fragment of a large and broad leaf which seems to be in concord with some fossils of the European Tertiary Flora hitherto collectively classed in the genus *Artocarpardium.* I preliminarily place this fragment in the latter, till more complete examples may be discovered for further and closer comparison.

The texture appears to be coriaceous, the secondary nerves are strikingly curved, and 2–3 centimeters distant from one another, whilst the tertiary ones are at 4–7 millimeters. It may be stated, from a sufficient part of the margin being well preserved, that it was untoothed. Only a part of the leaf near the apex is preserved, but, respecting size and form, the lamina shows a breadth of about 14 centimeters, and a roundly obtuse apex.

Locality and Horizon.—Old Rose Valley Lead, with the preceding. Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

MONIMIACEÆ.

MONIMIA VESTITA, *sp. nov.*

Plate XI, Fig. 10.

Sp. Char.—M. foliis coriaceis, petiolatis late lanceolatis, utrinque obtusis, apice angustatis, margine integerrimis; nervatione camptodroma; nervo primario prominente recto, versus apicem attenuato; nervis secundariis subangulis 60–70° orientibus, tenuibus, simplicibus vel ramosis; nervis tertiariis tenuissimis ramosis dictyodromis, vix conspicuis; reticulo obsoleto.

Obs.—The figure represents two leaves, the one partly covering the other. Regarding the form, texture, and nervation, they are indeed referable to species of the Monimiaceæ. Their carbonised substance, being preserved only on a single spot, permits one to presume that their texture may have been coriaceous. With a strong glass traces of a felt like that of *Monimia ovalifolia* are perceptable on their surface.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead.

HEDYCARYA WICKHAMI, *sp. nov.*

Plate XI, Figs. 11, 11A.

Sp. Char.—H. foliis coriaceis, ellipticis, utrinque paullo angustatis, margine dentatis ; nervatione brochidodroma ; nervo primario prominente recto ; nervis secundariis sub 70–80° orientibus, tenuibus, ramosis, laqueos marginales 1–2-seriatos formantibus ; nervis tertiariis sub angulis variis acutis et obtusis exeuntibus, abbreviatis, ramosis dictyodromis.

Obs.—Respecting both the formation and nervation, it almost agrees with *Hedycarya dentata*, Forst. (Ettingshausen, Blattskelete der Apetalen, Pl. XXVIII, figs. 1 and 2), and it only differs from the latter by a smaller leaf, by the secondary nerves, and by the teeth of the margin, both being closer to one another. In the enlarged Fig. 11A are represented the marginal loops of the secondary nerves, the tertiary being abbreviate and branched off at acute as well as obtuse angles, and the network.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township) ; ironstone shale from Newer Leads, under basalt.

LAURINEÆ.

CINNAMOMUM POLYMORPHOIDES, *McCoy.*

Plate XI, Figs. 3, 3A.

Ettingshausen, Beiträge z. Tertiärflora Australiens, I, *loc. cit.*, p. 27, Pl. III, fig. 2.

Obs.—I place here the leaf, Pl. XI, fig. 3, which, although more incomplete than that figured from Dalton, near Gunning, shows more distinctly the character of the species. In particular the camptodrome secondary nerves are stronger, and diverge from the primary on a lower spot beneath the middle of the lamina. As I have previously pointed out, the

above species deviates from *Cinnamomum polymorphum*, which is closely related to it, just by that character. Besides, the tertiary nerves and the network are well discernible, as represented in Fig. 3A (magnified), while they are not preserved on the fossil cited from Dalton. Another specimen, from Vegetable Creek, belonging to *Cinnamonmon polymorphoides*, shows besides the actinodrome nerves, basilar ones, which are fine like those on the living species, *C. zeylanicum*.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Main Vegetable Creek Deep Lead; brown carbonaceous clay, under basalt.

CINNAMOMUM LEICHHARDTII, *mihi*.

Plate XI, Fig. 4.

Ettingshausen, Beitiäge z. Tertiärflora Australiens, I, *loc. cit.*, p. 27.

Obs.—Several leaves of this species lie before us with which the fragment from Dalton, near Gunning, agrees well, the latter only belonging to a larger leaf. But this causes no difficulty, as it can easily be proved by the living species of *Cinnamomum* that their leaves vary much in size. On our species the basilar (secondary) nerves reach nearly the apex, at times they even do so. The tertiary running transversely, are strong. The preservation of the network is prevented by the oxidised condition of the sandstone matrix.

Locality and Horizon.—Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

CINNAMOMUM NUYTSII, *sp. nov.*

Plate XI, Fig. 5.

Sp. Char.—C. foliis breviter petiolatis rigide coriaceis, elliptico-oblongis, integerrimis utrinque angustatis, basi acutis; nervatione acrodroma, nervo primaro prominente, recto; nervis secundariis infimis suprabasilaribus; subangulis 30–40° orientibus, paullo curvatis, attenuatis, apicem fere attingentibus, nervis secundariis reliquis angulo subrecto egredientibus approximatis, tenuissimis, vix conspicuous; nervis tertiariis obsoletis.

Obs.—This species comes near to *Cinnamomum lanceolatum*, Ung., from which it deviates by a firmer texture, and by thinner secondary nerves. From *C. Woodwardii*, Ett., a species described and figured in Part I of these Contributions, it differs in the same characters, and by the basilar secondary nerves, which diverge from the primary one at more acute angles, and nearly reach the apex. The other secondary nerves being preserved only on a few spots near the apex, are approximate, but the tertiary ones are not distinguishable, either on the strongly carbonised substance of the leaf, or on the impression of the fossil.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, under basalt.

Genus DIEMENIA.

Gen. Char.—Folia coriacea integra, quoad nervos secundarios illis Laurorum vel Persearum, quoad nervos tertiarios illis Cinnamomorum similia.

DIEMENIA SPECIOSA, *sp. nov.*

Plate XI, Figs. 7–9.

Sp. Char.—D. foliis oblongis vel lanceolatis integerrimis, utrinque angustatis; nervatione camptodroma; nervo primario valido, recto, excurrente; nervis secundariis simplicibus valde prominentibus, arcuatis, marginem ascendentibus, subangulis 35–65° egredientibus; nervis tertiariis distinctis simplicibus vel furcatis, transversim inter se conjunctis; reticulo obsoleto.

Obs.—Leaves which betray the characters of the Laurineæ. They reach at least a length of 11 centimeters, and a breadth of 4 centimeters. Their form is equally narrowed towards the ends, and their texture is firmly coriaceous. The secondary nerves being strong, bent upwards and simple, diverge from a strong primary one at varyingly acute angles, and 10–15 millimeters distant from one another. Respecting this character, one might consider these leaves as belonging to *Laurus* or *Persea*. But the tertiary nerves are like those of *Cinnamomum*, namely, strongly prominent, flexuous, simple, or forking once, transversely anastomosing, and 2–3 millimeters distant from one another. A network is not discernible. The fossils Figs. 8 and 9 come from Elsmore, and Fig. 7 from Vegetable Creek.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, under basalt. Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

DIEMENIA PERSEÆFOLIA, *sp. nov.*

Plate XI, Fig. 6.

Sp. Char.—D. foliis oblongo-lanceolatis, integerrimis, utrinque angustatis; nervatione camptodrama; nervo primario pervalido, recto; nervis secundariis subangulis 55–65° orientibus, validis, leviter arcuatis, simplicibus, marginem adscendentibus; nervis tertiariis distinctis simplicibus vel furcatis, inter se conjunctis, fere transversariis.

Obs.—Closely allied to the preceding species, but deviating from it by somewhat stronger and more approximate secondary nerves, and by the tertiary ones, which are more or less oblique to the axis of the leaf. The fossil shows a breadth of 4 centimeters, and a length of about 10 centimeters. It accordingly almost perfectly agrees with the leaves of *Diemenia speciosa* respecting size and form, as well as the remaining marks of nervation.

Locality and Horizon.—Newstead, near Elsmore, with the preceding.

LAURUS AUSTRALIENSIS, *mihi.*

Plate XI, Figs. 1, 2, and 2A.

Ettingshausen, Beiträge z. Tertiärflora Australiens, I, *loc. cit.*, p. 28., Pl. IV, fig. 1.

Obs.—We have here leaves which come from Vegetable Creek and Elsmore. Though agreeing with the leaf from Dalton, near Gunning, in all essential characters, they are smaller. The present fossils betray a thick, coriaceous consistence like that of Dalton. On one of the specimens a *Laurus*-like network is visible, represented in the enlarged Fig. 2A. The determination of the genus which was before open to a degree of uncertainty, has been essentially strengthened.

Locality and Horizon.—Newstead, near Elsmore, with the preceding. Fox and Patridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from the Newer Leads, under basalt.

SASSAFRAS LESQUEREUXII, *sp. nov.*

Plate XI, Fig. 14.

Sp. Char.—S. foliis trilobatis, basi decurrentibus, lobis simplicibus, inæqualibus, margine remote denticulatis; nervatione actinodroma; nervo mediano valido, recto, primariis lateralibus subangulis 40–45° orientibus, prominentibus, rectis; nervis secundariis angulo subrecto egredientibus, tenuibus approximatis brochidodromis; tertiariis subangulo recto insertis, flexuosis ramosis, reticulum macrosynammatum formantibus.

Obs.—Though only a mere fragment of the leaf of this species could be obtained for examination, yet it was possible to determine the genus, and even the group of species related to. Its substance was somewhat thick and firm, but barely coriaceous, and its form trilobate. Fortunately just that part of the leaf which contains the essential character of its nervation, is preserved, namely, from where the lobes begin their divergence. The one lateral lobe, proceeding from a lower spot, is 13 millimeters broad; the other, coming from a higher one, is imperfectly preserved, but one can suppose from the fragment that it must have been broader than the former. The lamina of the leaf is protruded towards the base and somewhat decurrent. The borders are, as far as they are discernible, minutely toothed, the teeth being distant from one another and turned towards the apex. The nervation shows a strong middle primary nerve 2 millimeters broad, from which proceed alternately, and rather divergently, two lateral nerves, which are theprimary ones of the lobes. They are three times thinner than the middle one, notwithstanding their being perfectly prominent. The secondary nerves springing off at barely acute or rather right angles of divergence, are thin and looped, like those of *Sassafras officinale.* The tertiary nerves branch, shortly after their commencement, into a net of lax meshes, which agrees well with that of *Sassafras,* but less with that of *Aralia.*

Respecting the above-described characters, our fossil is to be considered similar to *Sassafras cretaceum,* Newb., from which it differs by thinner secondary nerves diverging at more obtuse angles, and by a finer tertiary net.

Should one compare both fossil species to the living species of *Sassafras,* one arrives at the conclusion that *Sassafras Lesquereuxii* evidently comes nearer in its characters to the latter species than *S. cretaceum,* a plant which would be more correctly classed with *Aralia,* just as the related species of the Dakota Group have previously been placed in *Sassafras.* But respecting the toothed borders and the basilar divergence of the lateral primary nerves, our species is still so distantly related to the living ones of the genus that even the question might be disputed there, whether it should be placed in a separate genus or not. At all events *Sassafras primigenium*, Sap., from the Eocene beds of Sézanne, still possessing divergently curved basilar nerves, might be considered by its untoothed leaves to be rather a transitory form among those already mentioned; whilst *Sassafras ferretianum*, Massal., from the younger Tertiary beds, is closely allied to the living *S. officinale* by its convergently curved basilar nerves and its untoothed margin.[*]

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

SANTALACEÆ.

SANTALUM FRAZERI, *sp. nov.*

Plate XI, Figs. 18–21.

Sp. Char.—S. foliis breviter petiolatis coriaceis, ovatis vel lanceolatis, basi acutis, apice acuminatis, margine integerrimis; nervatione camptodroma; nervo primaria tenui, recto; nervis secundariis subangulis variis acutis orientibus tenuissimis vix conspicuis.

Obs.—The leaves are small, coriaceous, short-petioled, entire, and varying in form from ovate to narrowly lanceolate. Their apex is more or less tapered, and their nervation imperfectly developed, as both tertiary nerves and network are wanting. These leaves show a great similarity to those of *Santalum osyrinum*, Ett., from the older European Tertiary Flora. They may be, perhaps, identical, but a decision on this point may be reserved for future investigation. A very similar analogy to our fossil species is *Santalum americanum*, Lesq., from the Flora of the Green River Group, and it seems to differ only by a thicker and shorter petiole.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

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[*] Relating to the above stated phylogenetic facts on the forms of *Sassafras*, it may be remarked that the fossils named and described as *S. germanicum* and *S. Æsculapi*, by Heer, do not belong to *Sassafras*. The former should be placed in *Acer*, and the latter referred to *Cinnamomum polymorphum*. Respecting the *S. Æsculapi*, the author observes that the leaves are membranaceous. But, as the qualities of both form and nervation exactly agree with those of *Cinnamomum polymorphum*, a mistake may have occurred. I suppose that Heer figured in this case only counterparts of leaf-fossils of *C. polymorphum*, and as they are often pallid when weathered, he has erroneously taken them for membranaceous leaves of another kind.

PROTEACEÆ.

PERSOONIA MURRAYI, *sp. nov.*

Plate XI, Figs. 16, 17, 17A.

Sp. Char.—P. foliis subsessilibus, coriaceis, anguste lanceolatis, utrinque acuminatis; nervatione brochidodroma; nervo primario tenui, vix prominente; nervis secundariis subangulis acutissimis orientibus, tenuissimis, ramosis, laqueos marginales formantibus; nervis tertiariis vix distinctis, reticuli parce evoluti areolis angustis longitudinalibus.

Obs.—The texture, shape, and nervation of these leaves led me to the genus *Persoonia.* The leaves of *P. lucida,* R. Brown, show an extraordinary likeness to them. The above fossils are linear-lanceolate, narrowed towards both ends, and very shortly petiolate. A scarcely prominent primary nerve sends out some secondary ones which are very fine, and diverge from it at angles of 10°–20°. Their loops are approximate to the margin. The tertiary nerves form a narrow-meshed network, the meshes being oblong, to be seen on the fragment, Fig. 17, by a glass, and in the enlarged Fig. 17A. There scarcely seems to exist any point of difference between the fossils described and the leaves of the abovenamed living species, excepting that the former possess a somewhat broader lamina, and that their tertiary nerves and reticle are less developed. Our species deviates from the fossil ones hitherto described by its narrower leaves and by its nervation.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

GREVILLEA PROXIMA, *sp. nov.*

Plate XI, Figs. 13, 13A.

Sp. Char.—G. foliis submembranaceis, linearibus, integerrimis, basi in petiolum brevissimum attenuatis, apice obtusis; nervatione brochidodroma; nervo primario vix prominente, recto; nervis secundariis subangulis acutissimis egredientibus opproximatis tertiariis inconspicuis.

Obs.—This species is closely related to ***Grevillea haeringiana,*** Ett., of the Lower Tertiary beds of Europe, and differs from it only by the approximate secondary nerves, and by the obtuse apex.

The analogous ***Grevillea linearis,*** R. Brown, living in Australia, exhibiting the same form, a similar nervation, but a firmer texture of the leaf, bears a minute spinula on the apex of their leaves, which are obtuse, and show a recurved margin. As the apex of the fossil leaf is not perfectly preserved, it cannot be decided whether a spinula was present or not; and as the under surface of the fossil is not visible, it is impossible to ascertain whether the margin is recurved, though the latter is probable, as well as that the under surface was covered with a felt. Fig. 13A represents a part of the leaf slightly enlarged.

Locality.—Vegetable Creek.

GREVILLEA WENTWORTHI, *sp. nov.*

Plate XI, Figs. 12, 12A.

Sp. Char.—G. foliis coriaceis, oblongis (?) pinnatisectis, laciniis oblongis obtusis, basi subcoarctatis, margine crenato-dentatis, dentibus mucronulatis (?); nervatione craspedodroma; nervo primario firmo secundariis subangulis 40–50° orientibus, rectis simplicibus; nervis tertiariis angulis variis acutis exeuntibus, ramosis; reticulo vix conspicuo.

Obs.—Fragments of pinnatisect and coriaceous leaves which according to their characters can scarcely be placed in any other order than the Proteaceæ. Fig. 12 represents only the upper part of the leaf with the apex. The presumed form of the lamina was oblong; the lateral segments are oblong, rounded obtuse, somewhat narrowed at base, rapidly smaller towards the apex; the terminal segment is small lobed at base, rather narrowed at apex, and there almost roundly obtuse. The borders of the segments are obtusely toothed. The teeth appear now and then somewhat thickened on their ends (see Fig. 12A, representing a segment enlarged), and it seems that they bear a spinula which is probably recurved towards the under surface. Accordingly, only the base of the spinula can be visible, and the before-mentioned thickenings may correspond to it. Of the nervation only the upper part of the primary nerve is to be seen which is straight and attenuated here, but probably strong in its other parts. The secondary nerves diverge from it at pretty acute angles, distant about one centimeter from one another, and run towards the borders. Tertiary nerves and network are slightly developed, the latter is only indistinctly perceptible. The comparison with the corresponding types of the living Proteaceæ led me to the species of *Grevillea* with pinnatisect leaves. Only when more completely preserved fossils have been discovered will their comparison with the nearest living species be possible. I do not find the fossil now described related to any one published.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

HAKEA DUTTONI, *sp. nov.*

Plate XII, Figs. 11, 11A.

Sp. Char.—H. foliis rigide coriaceis petiolatis, lanceolatis utrinque angustatis apice acuminatis, margine argute spinoso-dentatis; nervatione brochidodroma; nervo primario valido, apicem versus attenuato, recto; nervis secundariis tenuibus subangulis acutis variis orientibus, approximatis ramosis inter se conjunctis; nervis tertiariis e latere externo secundariorum angulis acutis exeuntibus, abbreviatis, ramosis, rete macrosynammato.

Obs.—From its characters this fossil may best be classed in *Hakea*, and is there related to species which possess stiffly coriaceous leaves. A comparatively thick carbonaceous substance, partly loosened from the fossil, indicates the evidently firm texture of its leaf. Besides, it is distinguishable by its teeth, ending with strong spines, a character found in *Hakea.*

Our fossil agrees in some points with *Lomatia*, for instance, *L. helicioides*, Sap. sp., *L. aquensis*, Sap., of the European Tertiary Flora, but they are only distantly related to it. The network, represented by Fig. 11A, (enlarged), shows broken nervules, corresponding to those of Proteaceæ.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, under basalt.

RHOPALA SAPINDIFOLIA, *sp. nov.*

Plate XII, Figs. 8–10, 10 A–C.

Sp. Char.—R. foliis coriaceis, petiolatis pinnati-partitis vel pinnatifidis, laciniis vel segmentis lateralibus valde approximatis plus minusve falcato-lanceolatis basi angustatis obliquis adnatis subdecurrentibus, margine antico dentatis; terminalibus subrhombeis lobatis; nervatione brochi-craspedodroma; nervo primario basi distincto, apicem versus valde attenuato; nervis secundariis tenuibus angulis acutis variis egredientibus, ramosis inter se conjunctis; nervis tertiariis ramosis dictyodromis, reticulo prominente, maculis ultimæ ordinis apertis.

Obs.—By a superficial comparison one might consider these leaves to be Sapindaceæ, especially if compared with the leaf of *Sapindus densifolius*, Heer (Tertiärflora der Schweiz, vol. III, Pl. LXX, fig. 1). But on closer examination one will easily perceive that their likeness to the just-named species, though striking at first sight, is not found to exist on a closer examination. At all events, the leaves are not pinnate, but only pinnatifid; their segments are sessile and somewhat decurrent along the rachis, being lanceolate, falciform, toothed towards the apex, and oblique at the base. The terminal segment is rhomboidal-ovate and obtusely lobed. The segments of the specimen, Fig. 10, being very approximate, cover one another along their upper borders. The shape of the leaf is broadly oblong, and its petiole incompletely preserved. The leaf, Fig. 8, shows a petiole of 17 millimeters in length and a narrower lamina. Its segments being as approximate as those of the former, are smaller. Another specimen not figured here, represents a part of a still smaller leaf, the segments of which are connected towards the apex. Another specimen, Fig. 9, exhibits more separated though somewhat decurrent segments. On the latter the nervation is best preserved. The primary nerve is only prominent at base, very much thinned along its course and curved towards the terminal segment. The secondary nerves are thin, ramous, united with one another; the tertiary ones lose themselves in a comparatively prominent network, the finest meshes of which are open. Fig. 9B represents the net less, and Fig. 9C more, magnified; Fig. 9A shows the form of a single mesh, strongly magnified.

The characters described suit no genus better than *Rhopala*, exhibiting species which possess pinnatisect leaves furnished with a nervation, both very similar to the fossil one. Fig. 9D shows a part of the nervation of the Brazilian *Rhopala affinis*, Pöhl, representing similar open net-meshes like those of our species.

The genus *Rhopala* is confined to tropical America, excepting only one species, *R. Bleasdalei*, F. v. Muell., discovered in New South Wales some years ago.

Locality and Horizon.—Old Rose Valley Lead, with many of the preceding species.

RHOPALA PARRYI, *sp. nov.*

Plate XII, Fig. 7, 7A.

Sp. Char.—R. foliis impari-pinnatis, foliolis lateralibus subsessilibus, submembranaceis, lanceolatis, basi obliquis, margine grosse spinoso-dentatis, terminali elongato; nervatione brochido-craspedodroma; nervo primario prominente; nervis secundariis tenuibus, subangulis acutis variis orientibus, flexuosis furcatis inter se conjunctis, ramo antico conjungente nervum marginalem formante, postico craspedodromo; nervis tertiariis rectangularibus dictyodromis, maculis ultimæ ordinis apertis.

Obs.—We have only a mere leaf-fragment before us, yet it exhibits sufficient characters for its determination. The leaf is pinnate; the leaflets are lanceolate, their borders spinously dentate, their base oblique, a little narrowed, sessile or by a very short petiole joined with the rachis. The texture is somewhat tender, almost membranaceous. The nervation represented in Fig. 7A, magnified, is partly well-preserved. A strong primary nerve sends out thin secondary ones at varying angles of divergence being mostly a little acute. Close to the borders each of them divides in two branchlets, one of which, namely, the anterior, runs up the margin to anastomose with the nearest secondary nerve, whilst the posterior one runs towards the margin, reaching the nearest tooth. The rectangular tertiary nerves form a network agreeing in its open meshes with that of the preceding species.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

LOMATIA BROWNII, *sp. nov.*

Plate XII, Figs. 4, 5.

Sp. Char.—L. foliis coriaceis, petiolatis, lanceolatis, basi subacutis vel obtusis, apicem versus angustatis, acuminatis, margine grosse spinuloso-dentatis; nervatione brochidodroma; nervo primario prominente, recto, apicem versus attenuato; nervis secundariis tenuibus, subangulis 50–60° orientibus, approximatis, ramosis inter se conjunctis; nervis tertiariis e latere externo secundariorum subangulis variis acutis obtusisque egredientibus, ramosis, rete macrosynammatum formantibus, reticulo evoluto.

Obs.—This species differs from the following ones by the base of its leaf being a little narrowed or sometimes roundly obtuse, and by its deeply dentate borders. Respecting nervation it agrees best with *Lomatia longifolia*, R. Brown, living in Australia, but its network is more developed than that of the latter species. Our fossil differs from *Lomatia prælongifolia*, Ett., described and figured in Part I of these Contributions, by its spinously dentate borders, by its secondary nerves, which are more approximate and less ascending, and by a more developed network represented in Fig. 4.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

LOMATIA FINNISII, *sp. nov.*

Plate XII, Figs. 1, 1A.

Sp. Char.—L. foliis subcoriaceis, longe petiolatis, late oblongo-lanceolatis basem versus valde, apice paullo angustatis, margine spinuloso-serrulatis; nervatione brochidodroma; nervo primario valido, prominente; nervis secundariis distinctis subangulis 70–80° orientibus, flexuosis, ramosis inter se conjunctis; nervis tertiariis extus subangulis acutis exeuntibus, abbreviatis, ramosis, dictyodromis.

Obs.—This species differs from all others of the genus described here; and, perhaps, from the similar *Lomatia helicioides*, Sap. sp., by the lamina being gradually broader towards the base, and towards the apex a little narrowed. The texture is a little coriaceous. The petiole reaches 20 millimeters. The secondary nerves arise at much more obtuse angles of divergence, and are less approximate than those of the other species here described. The tertiary nerves are merged in a network (see Fig. 1A, magnified), which is richly meshed, being comparatively prominent. As the meshes of the highest order are open, the network bears the type of that of the Proteaceæ, particularly of *Lomatia.*

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from Newer Leads (stanniferous), under basalt.

LOMATIA GOYDERI, *sp. nov.*

Plate XI, Figs. 15, 15A.

Sp. Char.—L. foliis subcoriaceis, breviter petiolatis, lineari-lanceolatis utrinque acuminatis, margine adpresse serrulatis; nervatione brochidodroma;

nervo primario basi prominente, apicem versus tenui; nervis secundariis subangulis acutis arcuatim orientibus, marginem adscendentibus, inter se conjunctis; tertiariis vix conspicuis.

Obs.—Closely related to *Lomatia aquensis*, Sap. var. *gracilis*. But our species possesses more approximate secondary nerves, its teeth being turned more towards the apex of the leaf. The nervation, represented in Fig. 15A, magnified, is almost equal to that of the named species from the Tertiary Flora of Provence. The texture seems to have been less firm.

In the American Tertiary Flora, *Lomatia microphylla*, Lesq., may be considered analogous to our species, from which it only deviates by the entire borders of its leaf.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from Newer Leads (stanniferous), under basalt.

LOMATIA CASTANEÆFOLIA, *sp. nov.*

Plate XII, Figs. 2, 2A, 3.

Sp. Char.—L. foliis coriaceis, anguste elongato-lanceolatis, apice longe acuminatis, margine remote spinuloso-dentatis; nervatione mixta, craspedo droma et brochidodroma; nervo primario prominente, apicem versus attenuato; nervis secundariis tenuibus, subangulis 50–60° orientibus, subflexuosis apice ramosis partim inter se conjunctis; nervis tertiariis tenuissimis, ramosis dictyodromis; reticulo valde evoluto, aperto.

Obs.—A very peculiar leaf which bears strikingly the facies of *Lomatia*, though by its shape and its craspedodrome secondary nerves we are reminded of *Castanea*. But in the formation of the network, it essentially deviates from the latter by the open nervules (see Fig. 2A, magnified), and agrees with the leaves of Proteaceæ. Among these it is characterised by its mixed nervation. Of the species of this order here described, only those of *Banksia* exhibit the same type of nervation, the latter possessing secondary nerves which are alternately brochidodrome and craspedodrome. Our fossil, however, is easily distinguishable from *Banksia* by the teeth of its borders, and by the facies of its network.

Lomatia Scottii, Lesq. sp. (*Myrica Scottii*, Lesq.), from the American Tertiary, might correspond to the above described species.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay from the Old Rose Valley Lead, on the Main Vegetable Creek Lead, Emmaville (Vegetable Creek Township).

LOMATA EVANSII, *sp. nov.*

Plate XII, Figs. 6, 6A.

Sp. Char.—L. foliis coriaceis petiolatis, oblongis basi acutis, margine spinulosodentatis; nervatione brochidodroma; nervo primario prominente recto; nervis secundariis subangulis 30–40° orientibus, approximatis, tenuibus, flexuosis, ramosis, inter se conjunctis; nervis tertiariis abbreviatis, subangulis variis insertis, rete macrosynammatum prominens formantibus.

Obs.—Agrees regarding texture and margin with the larger number of the describeds pecies of *Lomatia;* but differs from them by the following characters:—The form of the lamina is almost elliptical-oblong, and narrowed towards its ends. The secondary nerves being approximate, branch off almost immediately on leaving their point of divergence. They diverge from the primary nerve at very acute angles, forming congregated loops. The network is lax-meshed and prominent. The meshes of the highest order are open, as represented in Fig. 6A, magnified. Relating to this character it may be remarked that the finest network being very incompletely preserved on the fossil, is visible on one spot only. Amongst living species, *Lomatia illicifolia*, R. Brown; among fossil ones, *L. helicioides*, Sap. sp., might be considered as bearing a closer relationship to our species, but both the abovenamed exhibit borders different from those of our own.

Locality and Horizon.—Between Hill and Watson's shafts from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

Genus BANKSIA.

Obs.—The leaves of seven fossil species of this genus, confined to Australia at the present time, have been so far found in the beds of Vegetable Creek. The leaves of *Banksia* are eminently characterised by a coriaceous, often stiffly, firm texture, a more or less thickened margin, parallel to which runs a nerve, a mixed nervation, combining both the craspedodrome and brochidodrome type, by approximate secondary nerves, and a minutely-meshed network. Moreover, the leaves of the living *Banksia* are always more or less truncate, or at least roundly-obtuse on their apex. Respecting the above characters, the leaves of the fossil *Banksiæ* of Australia perfectly agree with those of the recent ones, excepting the last specified character.

Among the species described here, only one, *Banksia Campbelli*, possesses leaves being broad and obtuse on their apex; the other species exhibit leaves, the laminæ of which are narrowed gradually towards the apex; they are therefore analogous to the *Banksia* species of the European Tertiary Flora, which have mostly leaves gradually narrowed towards their apex.

BANKSIA LAWSONI, *sp. nov.*

Plate XIII, Figs. 1, 1*a*.

Sp. Char.—B. foliis coriaceis, breviter petiolatis, elliptico-oblongis, utrinque paullo angustatis, margine integerrimis; nervatione dictyodroma; nervo primario valido, recto; nervis secundariis tenuissimis approximatis parallelis, apice ramosis; nervis tertiariis brevissimis dictyodromis, rete microsynammato prominente.

Obs.—The petiole is 5 millimeters long; the oblong lamina is rapidly decreasing towards the base, and there barely acute, but towards the apex apparently narrowed. The borders are untoothed, sharply prominent, like those of leaves, especially of *Banksia*, to which a firm, coriaceous texture is due, and where the borders are thickened by a cartilaginous nerve. The primary nerve being comparatively strong and prominent, sends out numerous secondary nerves. They diverge at rather acute angles, are thin and approximate. Respecting their appearance near the margin, they anastomose, forming fine loops, which are discernible only on a few spots of the leaf. The tertiary nerves are much shortened, and lose themselves at once in a network which evidently bears the type of that of *Banksia*, especially of *B. integrifolia*, *B. serrata*, &c., being minutely meshed, but sharply prominent. Amongst the fossil species hitherto described, ours is nearest related to *Banksia Deikeana*, Heer, from the Tertiary Flora of Switzerland; but different from that just named by the secondary nerves being more approximate, and sent out at a little more obtuse angles of divergence.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

BANKSIA POOLII, *sp. nov.*

Plate XIII, Figs. 2, 2A.

Sp. Char.—B. foliis coriaceis oblongis (?) basi angustatis, margine minute spinuloso-denticulatis; nervatione mixta, brochido—et craspedodroma; nervo primario valido; nervis secundariis tenuibus approximatis parallelis sub angulis 60–70° orientibus, subflexuosis, apice ramosis; nervis tertiariis axi folii longitudinali parallelis, flexuosis, ramosis, inter se conjunctis; rete distincto, maculis subtetragonis.

Obs.—We have before us only a mere fragment of the leaf, represented in Fig. 2, yet showing all the characters of the leaves met with in *Banksia*. The species to which it pertains differs from the preceding one by its toothed borders by its secondary nerves, which are somewhat less thin, and produce loops near the margin, as well as by the tertiary nerves, which run in a longitudinal direction. The latter nerves and the network are represented in Fig. 2A, magnified.

The type of the prominent network agrees with that of several *Banksiæ*, of which I especially selected by way of comparison *B. littoralis*, R. Brown.

Locality.—Vegetable Creek.

BANKSIA HOVELLI, *sp. nov.*

Plate XII, Figs. 13, 13A, 14, 14A.

Sp. Char.—B. foliis coriaceis petiolatis, oblongo-lanceolatis, basi et apice attenuatis, margine spinuloso-serratis; nervatione mixta; nervo primario prominente recto; nervis secundariis subangulis 50–60° orientibus, tenuibus, arcuatis, approximatis, subparallelis, apice ramosis, partim laqueos marginales formantibus, partim ad sinus tendentibus et craspedodromis; nervis tertiariis abbreviatis dictyodromis; rete microsynammate prominente.

Obs.—Fig. 14 represents the top of a branchlet exhibiting three alternate leaves, and Fig. 13 a single leaf, showing a well-preserved nervation. The terminal bud is partly covered by the petiole of the uppermost leaf. The leaves being approximate, like those of all *Banksiæ*, are similar to those of *Banksia collina*, R. Brown, respecting texture, form, and nervation; but the former are more narrowed towards the apex, and their secondary nerves are more curved. The described leaves differ from those of the preceding species by their more sharply-toothed borders, by their somewhat stronger and prominent secondary nerves, and by their tertiary ones, which do not run in a longitudinal direction. The branchlets of the secondary nerves partly reach the teeth-sinus, and partly form the marginal nerve by their anastomosation, a character evidently exhibited by *Banksia collina*, *B. æmula*, and *B. serrata*. The living species named show also secondary nerves terminating in teeth. The network, represented in Fig. 13A (magnified) is not less developed than that of the preceding species. Fig. 14A (magnified) shows the branching of the secondary nerves which are divided into craspedodrome and marginal branchlets.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

BANKSIA MYRICÆFOLIA, *sp. nov.*

Plate XIII, Figs. 3, 3A.

Sp. Char.—B. foliis coriaceis, lineari-lanceolatis, apice acuminatis, margine spinoso-serratis; nervatione brochido-crospedodroma; nervo primario valido, prominente; nervis secundariis subangulis 65–75° orientibus, tenuibus flexuosis approximatis; nervis tertiariis axi folii longitudinali fere parallelis, flexuosis dictyodromis; rete microsynammato.

Obs.—Corresponds to *Banksia oblongata*, Cav., respecting the teeth of the margin being approximate and curved towards the apex, as well as the network, which is tender and richly developed (see Fig. 3A, enlarged). But it differs from this living species by the leaves being narrowed towards the apex, and it approaches *Banksia parschlugiana*, Ett., from the European Tertiary Flora in the same character.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

BANKSIA LANCIFOLIA, *sp. nov.*

Plate XII, Figs. 15, 15A.

Sp. Char.—B. foliis petiolatis coriaceis, anguste lanceolatis, basi acutis, apicem versus sensim attenuatis, margine spinoso-serratis; nervatione brochido-craspedodroma; nervo primario valido, prominente; nervis secundariis subangulis 55–65° orientibus, tenuibus subarcuatis, approximatis; nervis tertiariis rectangularibus, dictyodromis; rete microsynammato tenerrimo.

Obs.—Differs from the preceding species only by its leaf being still more narrowed towards the apex, and by mostly rectangular tertiary nerves, which lose themselves in a more tender network, as represented in Fig. 15A, magnified. In respect to most of the characters, particularly to the leaf being much narrowed towards the apex, this species approaches nearer to the *Banksiæ* of the European Tertiary Flora, especially to *B. Ungeri*, Ett. than the preceding one.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

BANKSIA BLAXLANDI, *sp. nov.*

Plate XII, Figs. 12, 12A and B.

Sp. Char.—B. foliis breviter petiolatis rigidis, lanceolatis utrinque angustatis, margine spinoso-dentatis; nervatione brochidodroma; nervo primario prominente apicem versus attenuato; nervis secundariis sub angulis 25–35° egredientibus, tenuibus; nervis tertiariis in rete microsynammato dissolutis vix conspicuis.

Obs.—The leaf before us can only be best compared to leaves of *Banksia*. Its carbonaceous substance, as well as its deep impression on the matrix, indicates a very firm and stiff consistence. Its shape is lanceolate, gradually narrowed into a short petiole, as well as towards the apex, the latter being incomplete on the fossil. The borders are toothed and thickened, and their teeth spinous. It should be stated from a part of the margin being well preserved, that the spinules are bent backwards or towards the under surface of the leaf; therefore their points are hidden in the matrix, whilst their bases, or at least their impressions, are plainly visible. The nervation exhibits a primary and little prominent nerve according to the thick substance of the leaf, and thinned towards the apex. The secondary nerves, diverging from the primary one at acute angles, are thin, and branch close to the borders. They form loops which are united to a marginal nerve, as represented in Fig. 12B, this being a distinguishing character of *Banksia*. Both tertiary nerves and network are incompletely preserved, and Fig. 12A (enlarged) has been made from one portion of the fossil only. The described fossil is very similar to the leaves of *Banksia australis*, R. Brown; but it also resembles those of *Hakea*, as, for example, *H. florida*, R. Brown. The latter, however, is founded upon a more distant relationship only, and accordingly our species is easily to be distinguished from the Hakea by its marginal nerve, its fine network, and numerous teeth. Among the fossil Proteaceæ hitherto described, *Hakea pseudonitida*, Ett., in some degree approaches our species, but deviates from it by characters above enumerated.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

BANKSIA CAMPBELLI, *sp. nov.*

Plate XIII, Figs. 4, 4A.

Sp. Char.—B. foliis rigide coriaceis, anguste lanceolatis basim versus angustatis, apice obtusiusculis, margine spinuloso-dentatis; nervatione brochidodroma; nervo primario prominente, apicem versus attenuato; nervis secundariis tenuissimis sub angulis 75–80° orientibus; nervis tertiariis tenuissimis in rete vix conspicuo dissolutis.

Obs.—This species is easily to be distinguished from the preceding ones by its pretty obtuse leaf. Its borders are more strikingly thickened and toothed by cartilaginous teeth, the impressions of which are very distinct. The nervation, represented in Fig. 4A (magnified), is only visible through a strong glass applied in a suitable light, as, unfortunately, the nervation of the fossil has been spoiled by rubbing.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

DRYANDRA PRÆFORMOSA, *sp. nov.*

Plate XII, Figs. 16, 16A, 17.

Sp. Char.—D. foliis coriaceis, linearibus, pinnatipartitis, lobis breve ellipticis vel ovatis, apice obtusiusculo muticis, integerrimis; nervatione camptodroma; nervo primario valido; nervis secundariis tenuissimis angulo subrecto exeuntibus approximatis, parallelis, inter se conjunctis; nervis tertiariis brevissimis, vix conspicuis.

Obs.—Very similar to *Dryandra formosa*, R. Brown, yet deviating from it by the more obtuse lobes of its leaf and by its secondary nerves, which are more numerous and approximate. The lobes are somewhat curved towards the apex, and their ends bear a minute thickening. The latter seems to correspond to a spinula, only the base of which is visible, whilst its apex is recurved and hidden, an appearance we have already met with in the stronger spinulas of the preceding species, especially of *Hakea* and *Lomatia*. Fig. 16A, magnified, represents the nervation of the lobes which agrees with that of *Dryandra* and *Banksia* in general.

Locality and Horizon.—Old Rose Valley Lead, with the preceding.

DRYANDRA BENTHAMI, *sp. nov.*

Plate XIII, Figs. 5, 5A.

Sp. Char.—D. foliis rigide coriaceis, linearibus, pinnatifidis, lobis late ovatis, obtusis, integerrimis; nervatione dictyodroma; nervo primario valido; nervis secundariis angulo subrecto exeuntibus, tenuissimis flexuosis vix conspicius, dictyodromis; nervis tertiariis rete microsynammatum formantibus.

Obs.—Only a small fragment of a leaf of this species has been collected at the abovenamed locality. It shows the most characteristic facies of a *Dryandra* leaf, being distinguishable even on a smaller fragment on account of the conformity of the lobes in all its parts. At all events the striking similarity of the fossil to the remains of *Dryandra acutiloba*, Ett. from the Tertiary Beds of Bilin, is most remarkable. The leaves figured in the "Fossile Flora von Bilin," Pl. XXXV, figs. 22 and 23, agree very closely indeed with the fossil from Vegetable Creek, represented in Pl. XIII, fig. 5. By a superficial comparison one might be easily induced to take them as identical, but on closer examination we see that there are some points of difference to be found relating to nervation. The Australian fossil shows four very thin secondary nerves running from the primary one to each lobe of the leaf. The tertiary nerves immediately lose themselves in a very tender, minutely-meshed reticle (Fig. 5A, magnified), the finest meshes of which are open. *Dryandra acutiloba* likewise exhibits four, rarely three or five, secondary nerves in each lobe of the leaf; but they are more prominent. The tertiary nerves being stronger, branch into a more lax meshed reticle, represented for comparison in Fig. 5B. *Dryandra Benthami* deviates from the preceding species only by its larger leaf, a smaller number of secondary nerves, and by its network being more developed. A spinula on the apex of the lobes seems to be wanting. I dedicate this species to the late George Bentham, the author of the master-work, "Flora Australiensis," who also examined the above-mentioned fossil from Bilin, and consented to the interpretation as belonging to *Dryandra*.

Locality and Horizon.—With the preceding species.

Gamopetalæ.

OLEACEÆ.

OLEA MACINTYREI, *sp. nov.*

Plate XIII, Fig. 21.

Sp. Char.—O. foliis coriaceis, lanceolato-oblongis, integerrimis, utrinque angustatis; nervatione camptodroma; nervo primario prominente, recto, nervis secundariis subangulis 70–80° orientibus, arcuatis; nervis tertiariis inconspicuis.

Obs.—We may suppose by the appearance of this fossil a stiffly coriaceous leaf, the form of which is lanceolate and equally narrowed towards both ends. The margin being sharply prominent, is untoothed, but rather undulate. Its nervation shows only a primary nerve, which is strongly prominent till the half length of the lamina, and some craspedodrome secondary nerves, which are scarcely prominent, at rather acute angles of divergence, and 6 millimeters distant from one another. Tertiary nerves are not visible. I compared this fossil to the leaves of *Olea apetala*, Vahl, living in New Zealand and Norfolk Island, and I found a striking likeness to exist between both. Tertiary nerves are also not visible on the living species. There seems to exist only one difference between that and the fossil species, namely, that the form of the leaf is more elliptical, and its apex obtuse on the former, whilst on the latter the form of the leaf is lanceolate and its apex acute.

Locality and Horizon.—Witherden's Tunnel, Two-mile, on Vegetable Creek Main Deep Lead, near Emmaville (Vegetable Creek Township); carbonaceous clay under basalt.

APOCYNACEÆ.

APOCYNOPHYLLUM KINGII, *sp. nov.*

Plate XIII, Fig. 10.

Sp. Char.—A. foliis subcoriaceis, petiolatis, oblongis, basi angustatis, margine integerrimis; nervatione camptodroma; nervo primario valido, prominente recto; nervis secundariis subangulis 80–90° orientibus, prominentibus, arcuato-flexuosis, ramosis inter se conjunctis; nervis tertiariis parce evolutis rectangularibus, ramosis inter se conjunctis rete macrosynammatum formantibus.

recurved. The nervation shows a comparatively strong primary nerve, being straight and prominent at apex, and almost regular secondary ones which run rather straight near the margin. It seems that they anastomose here by loops, yet the latter are scarcely discernible.

Apocynophyllum parvifolium, Ett., of the Fossil Flora of Haering, possesses similar leaves. In addition, *A. stenophyllum*, Ung., *A. elongatum*, Heer, and *A. attenuatum*, Heer, are worthy of remark, as being analogous to the fossil in the European Tertiary Flora. But our fossil is different from all the species named by the thick substance of its leaf and the obtuse ends of its lamina.

Locality and Horizon.—Witherden's Tunnel, Two-mile, on Vegetable Creek, Main Deep Lead; brown carbonaceous clay, below basalt.

Genus APOCYNOCARPUM.

Gen. Char.—Folliculis compressis, anguste lanceolatis, utrinque acuminatis.

APOCYNOCARPUM SULCATUM, *sp. nov.*

Plate XIII, Fig. 11.

Sp. Char.—A. folliculis lineari-lanceolatis, longitudinaliter sulcatis, leviter curvatis.

Obs.—Folliculous, resembling the fruits of *Apocynum*, *Nerium*, and other Apocyneæ. Our fossil fruit is linear-lanceolate, compressed, and striated in its length by three narrow furrows. Another specimen of a fruit is to be seen associated with it on the same matrix, which seems to appertain to a larger specimen of the same species. But the latter is less well-preserved than the former, and, therefore, not figured here.

Locality and Horizon.—Witherden's Tunnel, with the preceding species.

ASPERIFOLIÆ.

TRACHYPHYLLUM MYOSOTINUM, *sp. nov.*

Plate XIII, Figs. 19, 19A.

Sp. Char.—T. foliis conferte tuberculatis, breviter petiolatis, anguste lanceolatis utrinque acuminatis, integerrimis; nervatione brochidodroma;

nervo primario debili, recto, excurrente; nervis secundariis angulis acutis egredientibus, tenuissimis parallelis; nervo marginali inter se conjunctis.

Obs.—A small lanceolate leaf, almost equally narrowed towards both its ends, entire, and of a more tender consistence. Its surface is densely covered with minute nodules (see Fig. 9A, magnified), at all events appendages of the epidermis. The primary nerve is almost fine, straight, excurrent. The secondary nerves, visible only on parts of the fossil, are very thin, and joined by a somewhat undulate marginal nerve. No traces of tertiary nerves are perceptible.

This is a peculiar leaf, which bears the form and texture of some Myoporineæ, but especially the qualities of the epidermis and the nervation of *Myosotis*, and of other Borragineæ. We presume that it might be best classed in the latter order, which is also represented in Australia in the Flora of the present epoch.

Locality and Horizon—Old Rose Valley Lead, with many of the preceding species.

TRACHYPHYLLUM OBTUSUM, *sp. nov.*

Plate XIII, Figs. 18, 18A.

Sp. Char.—T. foliis confertissime granulosis, coriaceis, oblongo-lanceolatis, apice obtusis, basem versus angustatis, margine integerrimis; nervatione camptodroma; nervo primario debili, recto, infra apicem evanescente; nervis secundariis tenuissimis vix conspicuis.

Obs.—Another lanceolate leaf, obtuse on the apex, narrowed towards the base, coriaceous, and exhibiting an epidermical structure like that of the preceding species. Its surface shows the very same minute nodules, but they are closer together and less prominent than those of the former one (see Fig. 18A, magnified). The primary nerve is a little prominent only at base, straight, thinned in its course towards the apex, which it does not reach. The secondary nerves are very thin, only their traces being most discernible. I take this fossil likewise as an asperifolian leaf, and have now to remark that in calling it *Trachyphyllum*, I do not refer it to the Borragineæ (Asperifoliæ in the stricter sense) only, but also to the closely-related Cordiaceæ, and that I reserve the closer determination of the genus for future investigation.

Locality and Horizon.—Old Rose Valley Lead, with the preceding species.

MYRSINEÆ.

MYRSINE STOKESII, *sp. nov.*

Plate XIII, Fig. 20.

Sp. Char.—M. foliis subcoriaceis, oblongis, basi angustatis, integerrimis, acuminatis; nervatione camptodroma; nervo primario distincto recto; nervis secundariis numerosis, subangulis variis acutis orientibus, tenuibus flexuosis ramosis; nervis tertiariis tenuissimis, ramosis, inter se conjunctis; rete macrosynammatum formantibus.

Obs.—This species is very similar to ***Myrsine Endymionis***, Ung., from the Fossil Flora of Radobojj; but it differs from the latter species by the base of its leaf being less narrowed, by its more protruded apex, and by the secondary nerves which diverge from the primary one at varying angles. ***Myrsine salicifolia***, De Cand., might be considered an analogous species of the living Flora.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from Newer Lead, below basalt.

SAPOTACEÆ.

SAPOTACITES FORRESTI, *sp. nov.*

Plate XIII, Fig. 12.

Sp. Char.—S. foliis lanceolato-oblongis, coriaceis, integerrimis, apice rotundatis, basi angustatis; nervatione camptodroma; nervo primario valido, apicem versus valde attenuato, recto; nervis secundariis tenuissimis vix conspicuis.

Obs.—Very closely corresponding to ***Sapotacites sideroxyloides***, Ett. a species widely spread in the European Tertiary Flora, having been discovered in Haering, Sagor, Sotzka, Leoben, and many other localities. But, it differs from the abovenamed species by the secondary nerves, which are more distant to one another. Only traces of the network are perceptible, and one may conjecture from those that the network was very fine.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; carbonaceous clay, under basalt.

SAPOTACITES HUNTII, *sp. nov.*

Plate XIII, Figs. 13, 13A.

Sp. Char.—S. foliis anguste oblongis, petiolatis coriaceis integerrimis, basim et apicem versus angustatis; nervatione camptodroma; nervo primario distincto recto; nervis secundariis tenuissimis, subangulis 40–50° orientibus; nervis tertiariis vix conspicuis.

Obs.—This resembles *Sapotacites lanceolatus*, Ett., from the Tertiary beds of Haering and Sagor, but differs from it by the secondary nerves which exhibit a few other characters, represented in Fig. 13. The net-work is very fine, and resembles that of many Sapotaceæ. It is represented in Fig. 13A, magnified. The specimen from which the latter figure is taken is smaller than that of the former figure, and incomplete on its apex, but both are identical regarding the essential characters of the species.

Locality and Horizon.—With the preceding species.

Dialypetalæ.

ARALIACEÆ.

ARALIA FREELINGII, *sp. nov.*

Plate XIII, Fig. 26.

Sp. Char.—A. folii segmentis profunde partitis, laciniis subangulis acutissimis inter se divergentibus, majoribus basi contractis integerrimis, minoribus basi dilatatis; nervis secundariis laciniarum tenuibus flexuosis, subangulis 40–50° orientibus.

Obs.—The fossil represented in Fig. 26 doubtless belongs to a segment of the pinnatisect leaf of an *Aralia*. The segments which are on one and the same side diverge from one another at very acute angles (of barely 5°), or they run almost parallel to one another. The form of sinus which the segment define are, therefore, almost linear. The main segments or larger lobes are cuneately narrowed at their base, and are entire there. The smaller lateral lobes exhibit a broad base, which is likewise untoothed. The segments and their primary nerves diverge from the main primary nerve of the leaf at angles of 40° to 50°. The secondary nerves being thin and somewhat flexuous, are at the same angles of divergence. Only traces of the narrowly-meshed network are discernible. The texture of the leaf was coriaceous.

Respecting the above characters, our species is allied partly to *Aralia multifida*, Sap., from the Tertiary Flora of the Provence, partly to the living *A. elegans*, Hort. Par., from Granada, to which Saporta compared his already named species. But the distinguishing character of our species is, that the segments of leaf are more turned towards the apex, and that the intermedial sinus are very narrow.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, near Emmaville (Vegetable Creek Township).

ARALIA PRISCA, *sp. nov.*

Plate XIII, Figs. 23, 24.

Sp. Char.—A. foliis coriaceis, petiolatis, profunde palmato-septemlobatis, lobis valde angustis, longis, integris; nervatione actinodroma; nervis primariis validis, subangulo 30° inter se divergentibus; nervis secundariis tenuibus, subangulis 60–70° orientibus, arcuatis, simplicibus; nervis tertiariis e primariis angulo recto, e secundariis extus angulis, acutis egredientibus, dictyodromis.

Obs.—Two fragments of leaves of this species are before us. They offer characters in some measure complemental. Fig. 23 shows a fragment of a large palmatisect leaf, with its base. Only two of the seven lobes, as well as their strong primary nerves, are partly preserved. The base of the leaf shows a fragment of a thick petiole and seven primary nerves diverging from one another at pretty acute angles. By completing the shape of the leaf from its fragments, I find that the lobes are narrow, very long, and undivided. The nervation is partly preserved on the fragment, Fig. 24, belonging to a smaller leaf of the same species. Its primary nerves have the same acute angle of divergence. The secondary nerves, less acutely diverging, are fine and strongly curved along the borders. Tertiary nerves and reticulation only incompletely preserved. The former are at right angles to the primary nerve, and at oblique angles to the secondary. Fig. 23A (magnified) represents a part of the leaf exhibiting its network.

Of the fossil *Araliæ*, as yet published, the following are allied to our species: *Aralia primigenia*, De la Harpe, respecting the long, narrow, and undivided lobes; *A. multifida*, Sap., and *A. dissecta*, Lesq., relating to their greater number; one may finally add, *A. Jörgenseni*, Heer, from the beds of Unartok, as a species of the Arctic Tertiary Flora analogous to our own.

Locality and Horizon.—Old Rose Valley Lead, with the preceding species.

ARALIA OXLEYI, *sp. nov.*

Plate XIII, Fig. 25.

Sp. Char.—A. foliis coriaceis, palmato-lobatis, lobis inæqualibus, oblongis, basi contracta integerrimis, sub angulis acutis inter se divergentibus; nervatione actinodroma; nervis primariis laborum validis; nervis secundariis tenuissimis, sub angulis 50–60° insertis.

Obs.—The fossil, Fig. 25, belongs likewise to an *Aralia*. Very probably this was five-lobed; accordingly one should suppose that our fossil exhibits the middle lobe and the two lateral lobes of one and the same side. The lobes are not equal to one another; the exterior lateral lobe is at least smaller. All are somewhat narrowed at their base, and are entire there. The sinus has narrow angles of divergence, 20° to 30°. The strong primary nerves send out very thin secondary ones, being preserved only on a part of the first lateral lobe. The network is obsolete.

Relating to the breadth of the lobes, this species reminds us of *Aralia grœnlandica*, Heer, and taking the number of lobes into consideration one might find the *A. primigenia*, De la Harpe, to be an analogous species. But the former species possesses three-lobed leaves, and the latter much narrower lobes.

Locality and Horizon.—Old Rose Valley Lead, with the preceding species.

ARALIA ELSMOREANA, *sp. nov.*

Sp. Char.—A. follis palmato-lobatis (?); nervatione actinodroma; nervis primariis validis, subangulis 30–35° inter se divergentibus; nervis secundariis subangulis 55–65° orientibus, curvatis ramosis; nervis tertiariis e primariis angulo subrecto, e secundariis angulis acutis variis egredientibus inter se conjunctis rete macrosynammatum formantibus.

Obs.—A fragment of a large leaf being most probably palmatilobed, and plainly exhibiting the nervation of an *Aralia*, has been found at the abovenamed locality. It shows three almost equally strong primary nerves, which diverge from one another at very acute angles. The primary nerve, which is slightly stronger than the other two, might be considered the main or middle nerve of the leaf. Only the latter two, closest to the middle nerve, are preserved. They are, immediately after leaving their point of departure, but a little distant from the latter. Being divergently curved in their course, they rapidly gain greater distances from it. It is a distinguishing character that they fork above the base. The latter is especially common to *Aralia* leaves, for instance, to *A. quinquepartita*, Lesq. (Cretaceous Flora, I, 1874, Pl. XV, fig. 6), and *A. Saportana*, Lesq. (Cretaceous Flora, II, 1883, Pl. IX, figs. 1, 2). The slight divergence of the primary nerves at base indicates that there may have been some more of this order, in all from seven to nine. The secondary nerves being sharply prominent, are strongly curved, and those which come from the main primary nerve distant from one another about 2 centimeters. The tertiary nerves diverge from the primary at almost right angles, and are prominent; but those which come from the outer side of the secondary nerves diverge at varyingly acute angles. Through anastomosis they form a lax network, consisting of irregular-edged meshes. All the above characters agree well with those of *Aralia*, for example, *A. dissecta*, Lesq., of the North-American Tertiary Flora.

Locality and Horizon.—Newstead, near Elsmore, in concretionary ironstone (earthy limonite), associated with basalt.

LORANTHACEÆ.

LORANTHUS KENNEDYI, *sp. nov.*

Plate XIII, Fig. 17.

Sp. Char.—L. foliis coriaceis, brevissime petiolatis ovatis, utrinque obtusiusculis, integerrimis; nervatione hyphodroma; nervo primario crassiusculo, recto infra apicem evanescente; nervis secundariis vix conspicuis, basilaribus tenuissimis, angulis acutis orientibus.

Obs.—A small narrowly ovate leaf, which possesses a very short, thick petiole, an entire margin, and a firm, coriaceous texture. Its lamina is only a little narrowed towards both ends, and there somewhat obtuse. The primary nerve is comparatively thick, but disappears after its reaching the upper third of the lamina. Secondary nerves being very fine, at acute angles to the primary one, and flexuous, are only discernible at the base. I compare this leaf-fossil to the leaves of *Loranthus myrtifolius*, Cunningh., and *L. celastroides*, Sieb., both living in Australia. It is remarkable that the characters of the fossil species now described are exactly distributed in the named species of the present Flora. The first of them exhibits the short petiole and the very thin secondary nerves, the second shows the thick primary nerve disappearing below the apex, whilst the coriaceous texture and the obtusely ovate shape of the leaf are common to both. (See Ettingshausen, Blattskelete der Loranthaceen, Denksch. K. Akad. Wissensch. Wien, vol. xxxii, Pl. III, figs. 21, 22; Pl. IX, figs. 7–9).

Locality.—Vegetable Creek.

SAXIFRAGACEÆ.

CALLICOMA PRIMÆVA, *sp. nov.*

Plate XIII, Fig. 22.

Sp. Char.—C. foliis petiolatis subcoriaceis, oblongis, basi acutis, apice acuminatis, margine grosse serratis; nervatione craspedodroma; nervo primario distincto, prominente recto; nervis secundariis crebris subarcuatis, simplicibus vel apice furcatis; nervis tertiariis tenuissimis vix conspicuis.

Obs.—Corresponds perfectly to *Callicoma pannonica*, Ung. (Sylloge Plant. Foss. iii, Pl. XIII, fig. 1), from the Tertiary Flora of Eperies, Austro-Hungary. The petiole reaches the length of one centimeter. The carbonaceous substance, partly adhering to the fossil, indicates a somewhat firm, almost coriaceous texture. The lamina of the leaf is oblong, rapidly narrowing towards the apex. The teeth on the borders are sharply prominent. The secondary nerves reaching the teeth are approximate, and often branched towards the margin. Their branchlets run towards the teeth-sinus like those of the living Australian *Callicoma serratifolia*, Andr. The tertiary nerves are very thin, and at acute angles to the secondary ones. But they are not approximate, and by this character our fossil leaf deviates from the similar leaves of some species of *Quercus*. Relating to the essential leaf characters, our species agrees very well indeed with the species of the Tertiary of Europe just named; and according to this, perhaps, both may be considered identical. As, however, our fossil exhibits a slight difference in the form of its lamina being less lanceolate and less narrowed towards the apex than the *C.*

pannonica, both fossil species may be separated from each other, until future investigations may point out sufficient arguments for their union. The nearest related living species is the already mentioned *Callicoma serratifolia*.

Locality.—Vegetable Creek.

CERATOPETALUM MACDONALDI, *sp. nov.*

Plate XIII, Figs. 14, 14A.

Sp. Char.—C. foliis simplicibus, petiolatis coriaceis lanceolatis, acuminatis minute argute calloseque serratis; nervatione dictyodroma; nervo primario distincto, recto, apicem versus tenui; nervis secundariis subangulis 70–85° orientibus, numerosis, tenuibus, valde approximatis, flexuosis, ramosis; nervis tertiariis abbreviatis ramosis; rete microsynammatum formantibus.

Obs.—The leaves are coriaceous, varying from broad to narrow-lanceolate. Relating to the form of their ends, they narrow varyingly at base and gradually towards the apex. The borders are sharply toothed, the teeth being minute and cartilaginous. The nervation shows a straight primary nerve, being only prominent at base and much thinned in its course towards the apex. The secondary nerves, diverging at scarcely acute angles, are numerous, approximate, thin, and somewhat flexuous and branched near to their ends. Their marginal branchlets, reaching the teeth-sinus, terminate there, thickened like those of *Ceratopetalum*. The tertiary nerves, being very fine, lose themselves in a minutely meshed network immediately after leaving their point of divergence. (See Fig. 14A, magnified.)

Our species is allied to *Ceratopetalum bilinicum*, Ett. (Fossil Flora of Bilin., iii, Pl. XL, figs. 26, 30, 31), from which it deviates by its more approximate secondary nerves, diverging at more obtuse angles.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, under basalt.

CERATOPELALUM GILESII, *sp. nov.*

Plate XIII, Figs. 15, 16, 16A.

Sp. Char.—C. foliolis sessilibus vel breviter petiolatis coriaceis, lanceolatis subobliquis utrinque acuminatis, minute argute calloseque serratis;

nervatione dictyodroma; nervo primario distincto, tenui, recto; nervis secundariis subangulis 50–60° orientibus, approximatis, tenuibus, arcuatis, flexuosis, ramosis; nervis tertiariis in reticulum dissolutis.

Obs.—This species differs from the preceding species by its compound leaves. The leaflets are sessile or possess a short petiolule. Their form is lanceolate, slightly inequilateral, acuminate at both ends; the borders are toothed, their teeth being minute, close, and thickened. The nervation is like that of the preceding species, yet its secondary nerves quit the primary one under more acute angles. (See Fig. 16A, magnified.)

It corresponds exactly to *Ceratopetalum gummiferum*, Smith, living in Australia, from which it only differs, perhaps, by its secondary nerves being more curved along the borders, whereby we suppose that the leaves are trifoliate like those of the just mentioned species.

Locality and Horizon.—With the preceding species.

TILIACEÆ.

ELÆOCARPUS MUELLERI, *sp. nov.*

Plate XIV, Figs. 4, 5, 5A.

Sp. Char.—E. fructibus drupaceis, putamine ovoideo, rugoso-sulcato, quinque-loculari, foliis ovatis, acuminatis, serratis; nervatione brochidodroma; nervo primario prominente, recto, excurrente; nervis, secundariis subangulis 60–65° orientibus, distinctis, arcuatis, ramosis, 13–15^{mm} inter se remotis; nervis tertiariis e primario angulo subrecto, e secundariis extus angulo acuto egredientibus, inter se conjunctis, reticulum tenerrimum includentibus.

Obs.—The fossil fruit of this species has been found at Elsmore. A specimen is represented in Pl. XIV, fig. 4. Its shape is oval, and surface wrinkled, furrowed. There are three fine furrows visible on the free side, running from the base to the apex of the fruit in symmetrical distribution. The latter fact indicates the existence of five such furrows, which regularly divide the fruit into five parts. Two of these, laying on the opposite side, adhere to the matrix of the fossil and are consequently invisible. I have described and figured a similar fruit from the Tertiary Flora of Tasmania (Contributions, etc., Part I, Pl. VI, figs. 9–12), but its shape is narrower towards both ends, and its furrows are less prominent than on the above-described fossil. According to this difference these fruits cannot belong to the same species, though both are comparable only to the fruit-stones of *Elæocarpus sphæricus*, Gaertn., which likewise is divided into equal pieces corresponding to its five seed-receptacles.

The leaf, Pl. XIV, fig. 5, from Vegetable Creek, agrees so entirely with leaves of *Elæocarpus*, especially with those of *E. Cummingii*, that scarcely any doubt need arise on the question as to whether it should be united with the above fruit from Elsmore or not. *Elæocarpus Cummingii*, H.B.V. (Ettingshausen, Blattskelete der Dicotyledonen, Pl. LI, fig. 5), which is to be considered most analogous to our fossil species, strikingly approaches it in texture, form, borders, and nervation of the leaf, the latter being represented in Fig. 5A, enlarged.

Amongst the species of the European Tertiary Flora, the following may be considered as the nearest related species :—*Elæocarpus Albrechti*, Heer, the formation of the fruit, and *E. europæus*, Ett., from the Fossil Flora of Bilin, as regards the leaf.

I named this species in honor of Baron Ferdinand von Mueller, of Melbourne.

Locality and Horizon.—With the preceding species. And Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

ACERINÆ.

ACER SUBPRODUCTUM, *sp. nov.*

Plate XIV, Figs. 2, 2A, 3.

Sp. Char.—A. foliis petiolatis, palmato-trilobatis, lobis inæqualibus, lobo medio lateralibus longiore et latiore, valde producto, sinubus angulum acutum formantibus, margine remote dentatis ; nervatione actinodroma ; nervo medio prominente; nervis basilaribus lateralibus cum priore angulos 40-45° includentibus; nervis secundariis subangulis 50-60° orientibus, arcuatis ascendentibus, craspedodromis ; nervis tertiariis e latere externo secundariorum subangulis acutis egredientibus, inter se conjunctis; rete microsynammato.

Obs.—Corresponds in shape and nervation to the leaf to *Acer trilobatum*, A. Braun, var. *productum.* The network being very fine, is represented in Fig 2A, magnified. A species very closely allied to that just named, which

I called *Acer subtrilobatum*, has been collected from the tertiary strata of Shag Point in New Zealand. The latter differs from the Australian species only by its secondary nerves, which quit the primary one at more acute angles of divergence, and by the lobes of its leaf being less diverged from one another.

Locality and Horizon.—Between Hill and Watson's shafts in white pipeclay, from the Old Rose Valley Lead (stanniferous), on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township). Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

ACER SUBINTEGRILOBUM, *sp. nov.*

Plate XIV, Figs. 1, 1A.

Sp. Char.—A. foliis longe petiolatis, palmato-trilobatis, lobis integerrimis, acuminatus, lobis inæqualibus, patentibus, lobo medio lateralibus longiore et latiore; nervatione actinodroma; nervis primariis lateralibus cum primario angulos 30-40° includentibus; nervis secundariis paucis sub angulis acutis variis exeuntibus, tertiariis rectangularibus, ramosis, inter se conjunctis; rete microsynammato.

Obs.—Though I have strenuously endeavoured to class the maple-like leaf, Fig. 1, in another order than the Acerineæ, I have not succeeded. I could not find any genus to which this fossil might belong, excepting *Acer*. The latter exhibits the most numerous, as well as the closest, analogies to our fossil in both the recent and fossil Flora. In the genus, *Acer integrilobum*, Web., from the European Tertiary Flora approaches nearest to the above-described species, its network being exactly like that of *Acer*, is represented in Fig. 1A, magnified.

Locality and Horizon.—Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

MALPIGHIACEÆ.

BANISTERIOPHYLLUM AUSTRALIENSE, *sp. nov.*

Plate XIV, Fig. 13.

Sp. Char.—B. foliis coriaceis petiolatis, oblongo-lanceolatis, basem versus angustatis, margine integerrimis; nervatione camptodroma; nervo primario valido; nervis secundariis subangulis 60-70° orientibus, prominentibus, arcuatis simplicibus; nervis tertiariis tenuibus, e primario angulo recto, e latere externo secundariorum angulis acutis exeuntibus, transversim inter seconjunctis.

Obs.—The fossil represented in Fig. 13 is a part of a leaf of considerable size, oblong-lanceolate, entire, and possessing a thick petiole. The texture is coriaceous. The nervation consists of a strong primary nerve, being 2 millimetres broad at base, and strongly prominent secondary nerves, which are curved along the margin, and diverge at rather acute angles. The thin tertiary nerves diverge from the primary one at almost right angles, and quit the outer side of the secondary ones at acute angles; thus they run transverse to the leaf-axis. The network is not preserved.

After a close examination and comparison of copious material, I have made at least a provisional determination of the fossil described here. Its characters, especially the transverse tertiary nerves, indicate the Malpighiaceæ, near to *Banisteria.*

Locality and Horizon.—Watson's Starlight Claim, Tingha; carbonaceous clay from Deep Lead (stanniferous), under basalt.

MALPIGHIASTRUM BABBAGEI, *sp. nov.*

Plate XIV, Fig. 14.

Sp. Char.—M. foliis ovato-oblongis, coriaceis, integerrimis; nervatione camptodroma; nervo primario prominente; nervis secundariis subangulis 50–60° orientibus, curvatis, marginem adscendentibus, simplicibus ramosisque; nervis tertiariis transversim conjunctis.

Obs.—This leaf shows the type of Malpighiacean leaves like that of the preceding species. Similar fossils from the European Tertiary Flora have been classed in the collective genus *Malpighiastrum.* We consequently follow that practice, until the further examination of more complete specimens may result in a more definite disclosure of the precise nature of the genus.

Locality and Horizon.—Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

SAPINDACEÆ.

SAPINDUS GOSSEI, *sp. nov.*

Plate XIV, Figs. 15–17.

Sp. Char.—S. foliolis ovato-lanceolatis vel lanceolatis, brevissime petiolatis, apice acuminatis, basi subobliquis, margine integerrimis; nervatione camptodroma; nervo primario prominente, recto excurrente; nervis secundariis subangulis 55–70° orientibus, tenuibus, subflexuosis, ramosis inter se conjunctis; nervis tertiariis subangulis acutis exeuntibus, tenuissimis dictyodromis; rete microsynammato valde evoluto.

Obs.—The leaflet (Pl. XIV, Fig. 15) from Elsmore is very shortly petiolate and lanceolate, with an ovate base. A second leaflet (here represented in Fig. 17), from Vegetable Creek, is more oblong and inequilateral. The nervation, agreeing with that of *Sapindus,* is well preserved on a third specimen from Vegetable Creek, and represented in Fig. 16A, magnified. In the above-described characters this species most approaches the *Sapindus dubius,* Ung. (see Heer, Tertiärflora der Schweiz, vol. iii, Pl. LXX, figs. 9–11), from which one can only distinguish it by its short leaflets, and by its more developed network. *Sapindus caudatus,* Lesq., from the American Tertiary Flora, may be considered closely allied to, and only differs from the Australian species by a thinner texture, and by its leaflets being abruptly narrowed into a long sharply-pointed acumen.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from the Newer Leads (stanniferous). Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

CUPANITES SELWYNI, *sp. nov.*

Plate XIV, Figs. 12, 12A.

Sp. Char.—C. foliis coraceis, lanceolatis, basi acutis, apicem versus angustatis, margine undulato integerrimus; nervatione camptodroma; nervo primario valido, recto excurrente; nervis secundariis subangulis 70–85°, rarius subacutioribus orientibus, arcuatis, ramosis inter se conjunctis; nervis tertiariis tenuibus e primario sub angulo recto, e latere externo secundariorum subangulis acutis exeuntibus flexuosis, ramosis, inter se conjunctis; rete valde evoluto.

the shape of its leaf, our species approaches the preceding one, from which it principally differs by its more tender texture and its thinner primary nerve.

Locality and Horizon.—Dalton, near Gunning; in hard, siliceous grit, reposing on Silurian rocks.

ELÆODENDRON SUBDEGENER, *sp. nov.*

Plate XIV, Figs. 6, 6A.

Sp. Char.—E. foliis coriaceis, anguste lanceolatis basi angustatis dentato-crenulatis; nervatione brochidodroma; nervo primario firmo; nervis secundariis tenuibis, subarcuatis ramosis; tertiariis dictyodromis, reticulo valde evoluto.

Obs.—Closely allied to *Elæodendron degener* (*Ficus*, Unger, Fossile Flora von Sotzka) and only differing from it by the narrower lămina and a more developed network, represented in Fig. 6A, enlarged. The tertiary nerves are flexuous and anastomosing. Relating to size and shape of leaf our fossil, Fig. 6, corresponds to the specimen of *Elæodendron degener*, from Sotzka (loc. cit. Pl. XXXIV, Fig. 1).

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from Newer Leads (stanniferous), under basalt.

ILICINEÆ.

ILEX MACLEAYANA, *sp. nov.*

Plate XIV, Figs. 11, 11A.

Sp. Char.—I. foliis coriaceis, oblongo-ovatis, in petiolum angustatis, sparsim dentatis; nervatione brochidodroma; nervo primario distincto; nervis secundariis subangulis acutis orientibus abbreviatis, ramosis, inter se conjunctis, ramis cum nervis tertiariis rete macrosynammatum prominens formantibus.

Obs.—Corresponds in all its characters to *Ilex berberidifolia*, Heer, the network, being prominent and very similar to that of the latter, is represented in Fig. 11A, enlarged. The only marks of difference between the two species are, that the shape of the lamina of the above species is more oblong and the teeth of their borders less prominent than on the other.

Locality and Horizon.—With the preceding species.

RHAMNEÆ.

POMADERRIS BANKSII, *sp. nov.*

Plate XIV, Fig. 8; Plate XV, Figs. 1, 1A, and 2.

Sp. Char.—P. foliis coriaceis, petiolatis, late lanceolatis utrinque angustatis, margine undulatis vel subdentatis; nervatione camptodroma; nervo primario prominente; nervis secundariis subangulis 40–50° orientibus, tenuibus, subarcuatis, marginem adscendentibus; nervis tertiariis tenuissimis, valde approximatis flexuosis ramosis, transversim conjunctis.

Obs.—I place in this species three leaves figured in Figs. 1, 2, and 8, of the above plates. Although they are rather different in size, they agree with one another in shape and nervation so much that any separation into different species must be avoided. There exists a very distinguishing character which these leaf-fossils exhibit in regard to nervation. Their tertiary nerves run transverse to the leaf-axis, and are very fine, approximate, flexuous, and anastomosing. The camptodrome secondary nerves are curved along the margin. The shape of the leaf is oblong and the texture coriaceous. All these characters are due to the leaves of Rhamneæ. As among the genera of this order *Pomaderris* contains species showing leaves most similar to those of our fossil, I do not think I am in error in ranging it in that genus, the more so as it belongs to the endemic Flora of Australia. *Pomaderrites Banksii*, mihi., is another plant with membranaceous leaves.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on Vegetable Creek Main Deep Lead, Emmaville (Vegetable Creek Township).

DIOSMEÆ.

BORONIA HARRISII, *sp. nov.*

Plate XIV, Figs. 18, 18A.

Sp. Char.—B. foliis obovatis basi angustatis, apice acutis, serrulatis; nervatione dictyodroma; nervo primario tenui, flexuoso infra apicem evanescente; nervis secundariis ramosissimis; rete laxum formantibus.

Obs.—A small fragment of a leafed branchlet. Its leaves are small, close together, and opposite. They are obovate, acute, narrowed into a very short petiole, and their borders minutely toothed towards the apices, whilst in the other part of each leaf they remain entire. The nervation represented in Fig. 18A, enlarged, consists of a very thin primary nerve, and a few very fine secondary ones branching into a lax meshed network. The former nerve is somewhat flexuous, and so much thinned near the apex that it is only visible there by the aid of a glass. It usually disappears before the apex is reached.

This fossil plant is nearest to *Boronia serrulata*, Smith, living in Australia, but differs from it by the obovate leaves. In the latter character the fossil species approaches to *Boronia crenulata*, Smith, also living in Australia, but deviates from it by the acute apex and the toothed borders. According to these facts, our *Boronia* unites the characters of both living species abovenamed, and may be considered as their ancestor, notwithstanding their inhabiting different parts of Australia; the first-named is found in New South Wales, and the second in West Australia.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from New Leads (stanniferous), under basalt.

BARONIA HOOKERI, *sp. nov.*

Plate XIV, Figs. 19, 19A and B.

Sp. Char.—B. foliis crassiusculis, impari-pinnatis, impresso-glanduloso-punctatis; foliolis obovatis vel oblongis, apice obtusiusculis, margine integerrimis; nervatione brochidodroma; nervo primario distincto recto, excurrente; nervis secundariis angulo subrecto egredientibus, approximatis, subarcuatis; nervis tertiariis rectangularibus, furcatis vel simplicibus; recticulo parce evoluto.

Obs.—The fossil here represented in Fig. 19 shows a part of a compound leaf, consisting of the terminal and one lateral leaflet, adhering to a small fragment of the rachis. The terminal leaflet is obovate, narrowed towards its base and rather obtuse at the apex. The lateral leaflet is oblong, and its apex is not preserved. The rachis is narrowly winged. All these parts, the leaflets and the rachis, are finely dotted. The dots, examined through a strong glass, turn out to be small, roundish oil receptacles (glandules), which are immersed in the thick coriaceous leaf-substance. The borders of the leaflets are untoothed. The nervation shows a straight, sharply prominent primary nerve and several bent approximate secondary ones diverging from the primary at scarcely acute angles, and joined together by marginal loops. The tertiary nerves diverging and anastomosing in right angles, form a sparingly developed net, represented in Fig. 19A, magnified.

The above distinguishing characters have indeed facilitated the determination of this fossil, which might, perhaps, have proved difficult under other circumstances. There are only a few genera exhibiting leaves similar to the fossil, namely, *Boronia*, *Weinmannia*, and *Zanthoxylon*. *Weinmannia* and *Zanthoxylon* possess no leaves bearing oil glandules. *Zanthoxylon* does not show any species possessing such small and coriaceous leaves like our fossil; besides, we may take into consideration that this genus is wanting in the present Flora of Australia. Only *Boronia* remains, an Australian endemic genus in which types very similar to the fossil are to be found. I mention here only *B. variabilis*, Hook., *B. psoralioides*, De Cand., *B. crassifolia*, Barte., and *B. alata*, Smith. The two first named species have uni- or bi-jugate leaves, whilst *B. crassifolia* possesses bi-three-jugate, and *B. alata* five-jugate leaves. As at least one lateral leaflet and a considerable part of the rachis are wanting on our fossil, it is at present impossible to determine whether it originally possessed one or more pairs of leaflets. In order, therefore, to be enabled to point out the living species nearest related to the fossil, complete material must be at our command.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale from newer leads (stanniferous), under basalt.

COMBRETACEÆ.

Genus GETONITES.

Gen. Char.—Calycis tubo cum ovario connato, brevissimo, limbo supero quinquepartito, plano, persistente; laciniis ovato-ellipticis, quinquenerviis; staminibus calycis laciniis multo brevioribus.

GETONITES WILKINSONI, *sp. nov.*

Plate XV, Figs. 11, 11A, 12.

Sp. Char.—G. calycis laciniis ovato-ellipticis, obtusiusculis, quinquenerviis; foliis oblongo-ovatis, petiolatis, coriaceis, integerrimis; nervatione camptodroma; nervo primario valido apicem versus attenuato; nervis secundariis tenuibus, subangulis 55–60° orientibus, flexuosis, inæqualibus, simplicibus vel ramosis; nervis tertiariis e latere externo secundariorum sub angulis acutis exeuntibus, inter se conjunctis.

Obs.—The calyx represented in Fig. 12 shows a five-sect limb, the segments of which exhibit a firmer scarious texture. The form of the segments is more elliptical than oval, scarcely narrowed towards its ends and somewhat obtuse at apex. The nervation consists of five longitudinal nerves. They send out other lateral anastomosing nerves at acute angles. The extreme longitudinal nerves are shorter than the others and close to the margin. The gynæcium of the hermaphrodite flower is distinctly marked. The segments of the calyx are connate at their base with the gynæcium, on the periphery of which the basilar ends of the longitudinal nerves are still visible. Ovary is therefore inferum. The tube of the calyx is very short. The andrœcium shows some remains of the stamina. The latter are much shorter than the segments of the calyx, and at least double their number.

The determination of the family to which the calyx now described belongs, presents no difficulties, but it was impossible to range it in a living genus of this family. Respecting the family, Ebenaceæ, Convolvulaceæ, and Combretaceæ exhibit similar calyces, and some of them have been discovered in the Tertiary strata. But both the first and the second named family possess a free ovary, their calyx not being connate with it; they cannot therefore come into consideration here. Only the third family remains, to which all the above-described characters of flower suit best. Amongst the genera of the Combretaceæ only *Getonia* seems to agree with our fossil. But on closer examination we find some distinguishing characters between both which are too important to allow of our being blind to their influence upon the determination of the genus. The calyx of *Getonia* possesses a campanulate limb exhibiting lanceolate three-nerved segments, whilst our fossil calyx shows a flat limb with shorter and broader five-nerved segments. Besides, its tube is much shorter than that of *Getonia.* Therefore I think it better, in this case, to create a new genus which is closely allied to the one just named.

I unite with the described calyx a leaf, represented in Fig. 11. Its texture is strikingly thick and firm. The petiole is 6 millimeters long and 4 millimeters broad. The lamina is oblong-ovate, somewhat narrowed at the base, entire and recurved at the margin. The primary nerve is thick and strong, straight, rapidly narrowed towards the apex. The camptodrome secondary nerves are comparatively thin, undulate, unequal in their length, simple or branched near the margin, and anastomosing. They diverge from the primary nerve at rather acute angles. The tertiary nerves are flexuous, ramous, and anastomosing, and diverge from the outer side of the secondary ones at acute angles. The network, represented in Fig. 11A, enlarged, shows meshes which are partly rhomboidal, partly irregularly edged.

In regard to shape and nervation the above-described fossil leaf might, perhaps, be compared to species of *Terminalia* or *Combretum*, but neither of these genera exhibits such a strikingly thick consistence of leaf. Although this fossil may best be ranged into the Combretaceæ, no other living genus of that family can be found fit for its reception. It therefore seems to me that most of the arguments are in favour of classing our fossil in an extinct genus.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, Vegetable Creek Main Deep Lead, Emmaville (Vegetable Creek Township).

MYRTACEÆ.

EUCALYPTUS MITCHELLII, *sp. nov.*

Plate XV, Figs. 6–8, 7A and B.

Sp. Char.—E. foliis coriaceis, petiolatis, lanceloatis vel lineari-lanceolatis, subfalcatis, basi attenuatis, apice acuminatis, integerrimis; nervatione rochidodroma; nervo primario prominente; nervis secundariis subangulis 50–60° orientibus, approximatis tenuibus, subflexuosis, arcubus laqueorum in nervum marginalem confluentibus inter se conjunctis; nervis tertiariis e secundariis extus sub angulis acutis egredientibus; reticulo microsynammato.

Obs.—The fossil leaves represented in Figs. 6, 7, and 8, doubtless belong to one and the same species. They are equal in texture, shape, and nervation, and only show fragments of different parts of leaf. The specimen, Fig. 7, exhibits the petiole and the rather narrowed base of leaf, and the specimen, Fig. 6, shows the lamina of the leaf to be lanceolate and falciform. The texture is coriaceous as the above-mentioned specimens, and that of Fig. 8 indicate. Borders are untoothed. The nervation represented in Fig. 7A (enlarged), is well preserved on all specimens, and exactly shows the type of the Myrtaceæ. The primary nerve is prominent. The secondary nerves are thin, approximate, somewhat flexuous, and joined together by a marginal nerve. The tertiary nerves join the secondary ones in a direction which is oblique to the axis of the leaf. The network consists of minute meshes. The well preserved specimens, Figs. 6 and 7, exhibits fine dots, equally spread over the lamina. When examined through a strong glass they show themselves to be the receptacles corresponding to the oil glandules due to the leaves of Myrtaceæ.

A comparison of these fossils to the leaves of the recent Myrtaceæ led me directly to the large genus *Eucalyptus*. *E. rudis*, Endl., and *E. scabra*, Dum., both living in Australia, possess leaves very similar to our fossils. Among the fossil species hitherto described, ours corresponds to *Eucalyptus oceanica*, Ung., of the European Tertiary Flora. I will reserve the decision as to whether both species are to be united or not for future investigation.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale, from Newer Leads (stanniferous), under basalt.

EUCALYPTUS DIEMENII, *sp. nov.*

Plate XV, Figs. 9, 9*a*, 10.

Sp. Char.—E. foliis coriaceis, petiolatis, lanceolatis, basi acutis, apice acuminatis, integerrimis; nervatione brochidodroma; nervo primario, prominente; nervis secundariis subangulis 65–75° orientibus, valde approximatis fere congestis, tennibus, subrectis, nervo marginali inter se conjunctis; nervis tertiariis e secundariis extus angulis acutis egredientibus, abbreviatis.

Obs.—The leaf is smaller and broader than that of the preceding species, not falciform and less narrowed at apex. Its most distinguishing character is that the secondary nerves are very close to one another, and that they quit the primary one at rather acute angles of divergence. From the close secondary nerves the tertiary ones are very much abbreviated, and the reticulation less developed (see Fig. 9A, magnified). Of the living species, *Eucalyptus marginata*, Seib., and *E. corymbosa*, Smith, correspond to our fossil, the first relating to form and texture, but the second to all the leaf characters.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, below basalt.

EUCALYPTUS HOUTMANNI, *sp. nov.*

Plate XV, Figs. 3, 3A.

Sp. Char.—E. foliis coriaceis, late lanceolatis, utrinque angustatis, integerrimis; nervatione brochidodroma; nervo primario firmo, prominente; nervis secundariis subangulis 65–75° orientibus, approximatis, tenuibus, subflexuosis, nervo marginali inter se conjunctis; nervis tertiariis vix conspicuis.

Obs.—Differs from the other *Eucalypti* described here by its larger and broader leaf. Besides, this species deviates from *Eucalyptus Mitchelli* by the secondary nerves diverging at more obtuse angles, and from *E. Diemenii* by the more distant secondary nerves. The nervation is represented in Fig. 3A, enlarged.

Corresponds to *Eucalyptus Haidingeri*, Ett., of the European Tertiary Flora, and to *E. robusta*, Smith, of the living Flora.

Locality and Horizon.—With the preceding species.

EUCALYPTUS HAYI, *sp. nov.*

Plate XV, Figs. 4, 5, 5A.

Sp. Char.—E. foliis coriaceis, petiolatis, lanceolatis, utrinque attenuatis, integerrimis; nervatione brochidodroma; nervis secundariis subangulis 30–40° orientibus, approximatis, tenuibus, flexuosis nervo marginali inter se conjunctis; nervis tertiariis e secundariis extus angulis variis acutis obtusisque egredientibus, inter se conjunctis.

Obs.—This species is different from the others here described in its secondary and tertiary nerves. The former are more flexuous, and diverge from the primary at more acute angles, the latter, varying in their angles of divergence, are unequal in their course, longitudinal and transversal intermixed, especially on the forepart of the leaf. The network partly preserved on the specimen, Fig. 5, is represented in Fig. 5A, slightly enlarged, and consists of irregularly-edged meshes.

Of the living *Eucalyptus*, *E. resinifera*, Smith, and *E. pilularis*, Smith, show a striking similarity to the fossil in leaf-formation.

Locality and Horizon.—With the preceding species.

CALLISTEMOPHYLLUM HACKII, *sp. nov.*

Plate XV, Figs. 20, 20A.

Sp. Char.—C. foliis subcoriaceis, lanceolato-linearibus, basin versus sensim attenuatis, margine integerrimis; nervatione brochidodroma; nervo primario distincto recto; nervis secundariis tenuissimis subangulis 15–25° orientibus, inter se remotis, flexuosis, nervo marginali inter se conjunctis; nervis tertiariis tenuissimis vix conspicuis.

Obs.—A narrow, nearly linear leaf, gradually contracted towards the base. Its texture seems to be scarcely coriaceous. Its lamina shows numerous dots, which correspond to oil glandules. The primary nerve is comparatively thin. The secondary nerves being very fine, and somewhat undulate, 5 to 6 millimeters distant from one another, diverge at very acute angles. The marginal nerves, joining the secondary ones, are prominent. The tertiary nerves are scarcely discernible, and rather hidden by strongly prominent folds which have been accidentally produced in the stone after fossilization of the enclosed leaf. The glandules are, nevertheless, distinctly visible. (See Fig. 20A, enlarged.) Analogous leaves are to be found in the genera *Callistemon*, *Melaleuca*, and *Eucalyptus;* for instance—*Melaleuca neariifolia*, Smith, *Eucalyptus amygdalina*, Labill., &c. Of the hitherto described fossil species of the *Callistemophyllum bilinicum*, Ett., approaches nearest to our species.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township); ironstone shale in Newer Leads (stanniferous), below basalt.

CALLISTEMOPHYLLUM BECKERI, *sp. nov.*

Plate XV, Figs. 17, 18.

Sp. Char.—C. foliis coriaceis, lineari-lanceolatis, integerrimis; nervatione brochidodroma; nervo primario prominente; nervis secundariis subangulis 25–35° orientibus, approximatis, tenuibus, flexuosis, ramosis, nervo marginali prominente inter se conjunctis; nervis tertiariis parce evolutis sub angulis variis exeuntibus.

Obs.—Two leaves of this species lie before me, represented here in Pl. XV, figs. 17 and 18. They are smaller than those of the other species of the above genus here described, but comparatively broader than that of the preceding one. The secondary nerves being fine, flexuous, and approximate, diverge from the primary one at pretty acute angles. Their marginal nerve is prominent. The tertiary nerves are at varying angles of divergence, but they quit the outer side of the secondary ones mostly at acute angles. The network being sparingly developed, is easily perceptible. The above-described species reminds us of *Callistemon speciosum*, De Cand., and *C. lanceolatum*, De Cand., of the present Flora of Australia, as it does also of *Callistemophyllum melaleucæforme*, Ett., of the European Tertiary Flora.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

CALLISTEMOPHYLLUM OBLIQUUM, *sp. nov.*

Plate XV, Fig. 19.

Sp. Char.—C. foliis coriaceis, lanceolatis, basi rotundato-obtuso obliquis, apice acuminatis, integerrimis; nervatione brochidodroma; nervo primario basi prominente; nervis secundariis subangulis 50–60° orientibus, approximatis, simplicibus subrectis, nervo marginali conjunctis; nervis tertiariis inconspicuis.

Obs.—The leaf of this species, represented in Fig. 19, betrays a coriaceous texture. It exhibits a lamina, being lanceolate and acuminate at apex. The base is broad, ovate, obtuse, and strikingly oblique. It seems that the fossil is somewhat displaced, notwithstanding the base appears, upon a close examination, to be originally inequilateral, and it is also not seldom to be found in *Eucalyptus*. The secondary nerves diverge from the primary one at less acute angles, and are less numerous than those of the two preceding species. The marginal nerve is very close to the margin. Excepting the character of the inequilateral shape, the leaves of *Callistemon marginatum*, De Cand., of *Myrcia rostrata*, Mart., and of *Nelitris paniculata*, Lindl., are similar to the fossil. In the absence of the tertiary nerves, the latter living species agrees with our own.

Locality and Horizon.—With the preceding species.

CALLISTEMOPHYLLUM SWINDENI, *sp. nov.*

Plate XV, Figs. 16, 16A.

Sp. Char.—C. follis coriaceis, breviter lanceolatis, basi angustatis, apice acuminato-productis, margine integerrimis; nervatione brochidodroma; nervo primario basi prominente apicem versus valde attenuato; nervis secundariis subangulis 55–65° orientibus, tenuibus, valde approximatis, flexuosis, nervo marginali tenuissimo inter se conjunctis; nervis tertiariis tenuissimis dictyodromis.

Obs.—A coriaceous leaf varying from lanceolate to almost obovate and bearing a strikingly protruded apex. The primary nerve is only prominent at the base, being considerably thinned towards the apex of the leaf. The secondary nerves diverging at rather acute angles are flexuous, and united with one another by a very fine marginal nerve. The tertiary nerves discernible only on a few spots of the leaf, produce a tender network which is represented in Fig. 16A, magnified.

The leaves show a remarkable similarity to *Callistemophyllum acuminatum*, Ett., of the Tertiary Flora of Leoben. The latter species exhibits secondary nerves diverging at more acute angles.

Locality and Horizon.—Fox and Partridge's claim, between Rose Valley and the Red Hill, 2 miles from Emmaville (Vegetable Creek Township), ironstone shale from Newer Leads (stanniferous), under basalt.

MYRTONIUM OBTUSIFOLIUM, *sp. nov.*

Plate XIV, Fig. 20; Plate XV, Figs. 14, 15, 15A.

Sp. Char.—M. foliis parvis, breviter petiolatis, coriaceis, ovatis vel ovato-oblongis, integerrimis, apice angustato obtusis; nervatione brochidodroma; nervo primario distincto, nervis secundariis tenuissimis nervomarginali conjunctis; tertiariis vix conspicuis.

Obs.—A small leaf of a Myrtaceæ, which I shall now denominate *Myrtonium*, as the name *Myrtophyllum* already designates fossils pertaining to another genus. Our leaf is shortly petiolate, rather acute, or almost obtuse at its broad base, and narrowed towards its obtuse apex. The primary nerve is distinctly discernible, but the secondary ones and their joining marginal nerve, represented in Fig. 15A, magnified, are very fine. Only traces of tertiary nerves are perceptible, but their character is not distinguishable.

The fossil generally agrees with leaves of *Myrtus* and *Myrcia.*

Locality and Horizon.—Between Hill and Watson's shafts in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

MYRTONIUM LANCEOLATUM, *sp. nov.*

Plate XV, Figs. 13, 13A.

Sp. Char.—M. foliis coriaceis, breviter petiolatis, lanceolatis, utrinque angustatis, margine revolutis, integerrimis; nervatione brochidodroma; nervo primario prominente; recto, nervis secundariis subangulis variis acutis egredientibus, approximatis, laqueos in nervum marginalem distinctum confluentes formantibus; nervis tertiariis parce evolutis indistinctis.

Obs.—Relating to its coriaceous texture, nervation and lanceolate lamina narrowing into a short petiole, especially respecting its recurved borders indicated by a corresponding thickened margin, this fossil resembles several forms of Myrtaceæ, which are mostly common to *Leptospermum* and *Melaleuca*, whereas the secondary nerves are rather more numerous, and diverge at more obtuse angles than those of the just-mentioned genera. Fig. 13A represents the nervation, showing the marginal nerve formed by connected secondary loops, as well as the dots which correspond to oil glandules.

Locality and Horizon.—With the preceding species.

PAPILIONACEÆ.

DOLICHITES CORIACEUS, *sp. nov.*

Plate XV, Fig. 24.

Sp. Char.—D. foliolis coriaceis, rotundato-ellipticis, inæquilateris, integerrimis; nervatione camptodroma; nervo primario valido; nervis secundariis subangulis 50–60° orientibus, adscendentibus, inferioribus extus ramosis, reliquis simplicibus; nervis tertiariis e latere externo secundariorum subangulis acutis exeuntibus, inter se conjunctis, basilarium prominentibus.

Obs.—One can scarcely doubt that the leaf-fossil represented in Fig. 24, is a leaflet of a Phaseoleæ. It betrays a coreaceous texture, and being roundish-elliptical and entire in shape, shows an inequilateral development. The primary nerve is strongly prominent and sends out strong secondary ones, which are curved along the margin, ramous at the base of the lamina, but simple in their other part. The tertiary nerves proceed from the outer side of the secondary ones at acute angles, and are almost transversely anastomosing. This fossil is strikingly similar to the rather large leaflets of *Dolichites* *maximus*, Ung., from the Fossil Flora of Radoboj, but differs from the latter by its coriaceous texture, and the basilar secondary nerves producing less prominent tertiary ones.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; brown carbonaceous clay, under basalt.

DALBERGIOPHYLLUM AFFINE, *sp. nov.*

Plate XV, Figs. 21, 22.

Sp. Char.—D. foliolis breviter petiolulatis ovatis, basi rotundatis, apicem versus angustatis; nervatione camptodroma; nervo primario basi prominente apicem versus valde attenuato; nervis secondariis tenuissimis, tertiariis inconspicuis.

Obs.—The leaflet is shortly petiolated, ovate, and its texture more tender, almost membranous. The nervation shows a straight primary nerve, prominent only at its base, but rapidly thinned in its course, and very thin secondary nerves diverging at rather acute angles.

Respecting its facies this leaflet closely approaches those of *Dalbergia primæva*, Ung., from the European Tertiary Flora. Whether *Dalbergiophyllum Diemenii* (*Dalbergia*, Ett., Contributions, &c., Part I, Pl. VI, fig. 16), from the beds of Dalton, near Gunning, which also strongly resembles the *Dalbergia primæva*, might be identical to the here described species or not, could only be positively determined if richer material were at our command.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, from the Old Rose Valley Lead, on the Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

CÆSALPINIEÆ.

CASSIA CASTANOSPERMOIDES, *sp. nov.*

Plate XV, Figs. 27, 28, and 28A.

Sp. Char.—C. foliolis subcoriaceis, petiolulatis, lanceolatis, basi acuta plus minusve inæqualibus, apice acuminatis, margine integerrimis; nervatione brochidodroma; nervo primario prominente; nervis secondariis tenuibus, subangulis 50–60°, infimis subacutioribus orientibus, flexuosis arcuatis, ramosis; nervis tertiariis angulis subrectis exeuntibus, subtilibus, flexuosis ramosis, dictyodromis; rete enerrimo valde evoluto.

Obs.—The leaves represented in Figs. 27 and 28 doubtlessly belong to the Leguminoseæ. They are lanceolate, coriaceous, and oblique leaflets, and petiolate at base, acuminate and somewhat protruded at apex, and entire at margin. The petiolule is 6 millimeters long, and being somewhat thickened exhibits fine transverse wrinkles, like those of many Leguminoseæ which possess larger leaflets. The nervation, well preserved on the specimen Fig. 27, and represented in Fig. 28A, enlarged, shows a pretty strong and prominent primary nerve, and fine flexuous secondary ones, slightly curved towards the borders. Their angles of divergence are more acute near the base of the leaflet than in its other parts. The loops are rather approximate to the borders. The tertiary nerves being very tender, are short, flexuous, and ramous. Their angles of divergence are hardly acute. The tertiary network consisting of irregularly, edged meshes, encloses a very fine and minutely meshed quarternary one.

Respecting texture, shape, and some characters of nervation, the above-described leaflets are very similar to those of *Castanospermum australe*, Vent. Yet the leaflets of the latter species living in Australia deviate from the fossil ones by the following characters:—The base is roundly obtuse, not narrowed; the petiolule is shorter; the secondary nerves diverge near the base of the leaflets at more obtuse angles than in its other parts; their loops are more distant from the borders, and bear some rows of meshes on their outer side; finally the tertiary nerves proceed predominantly at acute angles, and are almost transversely anastomosing. Regarding these important marks of difference no reasonable conjecture can be offered as to the generic affinity of our fossils and *Castanospermum australe*. Besides, it ought to be taken into consideration that the above-described fossil agrees better with *Cassia* than *Castanospermum*, except the Australian species of the former. Relating to comparison of the just mentioned fossil to similar ones of the hitherto known fossil floras, *Cassia*, particularly *C. phaseolites*, Ung., of the European Tertiary Flora, have likewise been recognised as most approaching our fossil species.

Locality and Horizon.—With the preceding species; and Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead.

CASSIA PHASEOLITOIDES, *sp. nov.*

Plate XV, Figs. 25, 26.

Sp. Char.—C. foliolis coriaceis, petiolulatis (?), ovato-lanceolatis inæquilateris, basi obtusis, apicem versus angustatis, margine integerrimis; nervatione brochidodroma; nervo primario valido; nervis secundariis distinctis crebis parallelis, nervis tertiariis angulo acuto egredientibus.

Obs.—This species, closely allied to the preceding one, differs from it by the following characters. The texture is firmer, the leaflets are somewhat broader, more inequilateral and obtuse at their base. The secondary nerves are numerous, parallel, and send out tertiary ones at acute angles of divergence. Our species is likewise related to *Cassia phaseolites*, and differs from *C. pseudophaseolites*, Ett. an analogous species of the New Zealand Tertiary Flora, by a somewhat firmer texture and its nervation.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township), on Vegetable Creek Main Deep Lead; carbonaceous clay, under basalt.

PODOGONIUM MACROCARPUM, *sp. nov.*

Plate XV, Figs. 29, 29A, and 30.

Sp. Char.—P. legumine elliptico, valvis post maturitatem usque ad basin angustatam dehiscentibus; semini oblongo; foliolis oblongis apice productis; nervatione brochidodroma; nervo primario distincto; nervis secundariis subangulis 40–45°, inferioribus subacutioribus orientibus, tenuibus flexuosis; tertiariis subangulis variis acutis egredientibus, tenuissimis flexuosis ramosis.

Obs.—The fossil, represented in Fig. 30, exhibits a dehiscent legume which most agrees with that of *Podogonium*. It is elliptical, compressed, membranous, and opened along its length to its narrowed base. A flatly circumscribed, oblong-elliptical portion, doubtlessly indicating the space which might have been occupied by the only seed, is perceptible in its midst. The seed, which may have fallen out, must have been compressed like the fruit. Respecting shape, texture, and formation, the above-described legume perfectly resembles *Podogonium*, and deviates only in size from the *Podogonium* fruits hitherto known. It was attached to a pedicel; but only a trace of it is to be seen, just sufficient to state its existence.

With this legume a small leaf, Fig. 29, has been found at Vegetable Creek, which, respecting form, texture, and nervation, most agrees with those of *Podogonium* leaflets. It is oblong, and scarcely narrowed at apex. The primary nerve is percurrent and prominent. The secondary nerves are numerous, fine, somewhat undulate, and the basilar ones diverging at more acute angles than the others. The tertiary nerves, being very fine and abbreviate, proceed at varying acute angles, and anastomose into a very tender but slightly developed net, Fig. 29A, enlarged.

The leaflet of *Podogonium Knorrii* which Heer has figured in his Tertiärflora der Schweiz (vol. III, Pl. CXXXVI, fig. 2), exhibiting a rather protruded apex, agrees best with the above-described one. The latter is different from the former only by its secondary nerves being a little more distant. The basilar ones are barely twice as long as the others.

Locality and Horizon.—Between Hill and Watson's shafts, in white pipeclay, Old Rose Valley Lead, on Main Vegetable Creek Deep Lead, Emmaville (Vegetable Creek Township).

COPAIFERA AUSTRALIENSIS, *sp. nov.*

Plate XV, Figs. 23, 23A.

Sp. Char.—C. foliolis coriaceis, brevissime petiolulatis (?), ovato-oblongis inæquilateris, basi rotundata obliquis, apice acutis; nervatione camptodroma; nervo primario prominente, recto, excurrente; nervis secundariis angulis acutis variis egredientibus tenuibus, adscendentibus; nervis tertiariis tenuissimis dictyodromis; rete subtilissimo valde evoluto; maculis minimis æqualibus.

Obs.—The existence of the American genus *Copaifera* in the Tertiary Flora of Europe is proved by legumes and leaflets discovered in the Tertiary strata. It is very probable that this genus is present in the Tertiary Flora of Australia. There lie indeed only leaflets before us, upon which that probability is based; but the leaflets of *Copaifera* are characterised by such striking features that at least the hitherto known living species may be safely distinguished from those of other genera. The fossil represented in Fig. 23 corresponds almost perfectly to those of the Radoboj Flora, referred to a legumen of *Copaifera* and denominated *C. radobojana* by Unger (see Sylloge Plant. Foss., ii, Pl. XI, figs. 4–9). Whilst the most minute-meshed network, particularly characterising the leaflets of *Copaifera,* is not preserved on the fossil of Radoboj, it is distinctly perceptible on the leaflets of the Australian species, and represented in Fig. 23A, enlarged. The leaflet above described differs from those of the Radoboj leaflets by its more oblong shape.

Locality and Horizon.—Witherden's Tunnel, Two-mile, near Emmaville (Vegetable Creek Township); brown carbonaceous clay, under basalt.

PLANTÆ INCERTÆ SEDIS.

Genus SAPINDOSTROBUS.

Gen. Char.—Strobili brevi cylindrici squamæ plures, axi spiraliter insertæ, imbricatæ, oblongæ obtusæ, marginem versus vix attenuatæ, persistentes.

SAPINDOSTROBUS DUBIUS, *sp. nov.*

Plate XV., Fig. 38.

Sp. Char.—S. strobilis circ. $3\frac{1}{2}^{cm}$ longis et $1\frac{1}{2}^{cm}$ latis, squamis lignescenti-coriaceis, basem versus sensim minoribus.

Obs.—The only specimen here figured, an opened cone, which unfortunately is imperfectly preserved, lays before me. It is short, bears almost the facies of a small cone of the Pinus group *Picea* or *Larix,* but differs from them by its scales. They are oblong, obscurely ribbed-striate, and scarcely thinned at their margin; texture is more ligneous than coriaceous. Respecting its other characters, the cone seems to be related in some degree to those of the sub-genus *Sapinus.* The classification of this fossil still being doubtful, may be pointed out by future investigations when they might be based upon a more complete material.

Locality and Horizon.—With the preceding species.

CARPOLITHES AMARANTHACEUS, *sp. nov.*

Plate XV, Figs. 31, 32, 32A.

Sp. Char.—C. fructu utriculiforme, ovato-elliptico, utrinque obtuso, tenuiter rugoso, supra medium circumscisso, operculo lævi.

Obs.—The fruit represented in Figs. 31 and 32 in natural size, and in Fig. 32, magnified, is oval-elliptical, roundly obtuse at its ends, finely wrinkled on its surface, and above its middle circumscissile. The operculum is smooth. This fruit resembles those of several Amaranthaceæ, which are operculate.

Locality and Horizon.—Newstead, near Elsmore; in concretionary ironstone (earthy limonite), associated with basalt.

CARPOLITHES PYGEOIDES, *sp. nov.*

Plate XV, Fig. 33.

Sp. Char.—C. fructu transverse oblongo, subreniformi, medio contracto, superficie tenuissime granuloso.

Obs.—A transversely oblong fruit, being somewhat contracted at its middle, and consequently almost reniform. The surface is finely granulous. This fossil reminds us of the fruit-stone of *Pygeum*, a genus of the Amygdaleæ inhabiting tropical Asia.

Locality and Horizon.—With the preceding species.

CARPOLITHES MORISONIÆFORMIS, *sp. nov.*

Plate XV, Figs. 34, 35.

Sp. Char.—C. seminibus (?) compresso-reniformibus, lævibus.

Obs.—A peculiar fruit being compressed-reniform. It offers some likeness to the seeds of *Morisonia* which are embedded in the pulp of a bacca. Its surface is perfectly smooth. *Morisonia* is one of the Cappárideæ inhabiting the Antilles.

Locality and Horizon.—With the preceding species.

CARPOLITHES WETHERELLIOIDES, *sp. nov.*

Plate XV, Figs. 36, 37.

Sp. Char.—C. fructu 7-loculari, subgloboso, circa 5^{mm} lato.

Obs.—A fruit somewhat compressed from the surface, orbicular in its transverse section, containing seven cells. It shows some resemblance to *Wetherellia*, but it is much smaller than the fruits of the latter genus of the Eocene Flora of Sheppey. Fig. 36 represents the side view, and Fig. 37 the end view of the fruit.

Locality and Horizon.—With the preceding species.

[IV. — STRATIGRAPHICAL NOTES ON THE LOCALITIES MENTIONED IN THE SECOND PART OF THIS WORK.

In Baron von Ettingshausen's original Memoir, most of the species from the New England district are quoted as from "Vegetable Creek." As a matter of fact, the specimens in question were collected under the immediate superintendence of the Government Geologist, and Mr. Geological-surveyor T. W. E. David, B.A., &c., from three localities in that district, and representing two distinct horizons. In the hurry attending the despatch of the collection to Graz, the necessity of providing Baron von Ettingshausen with this information appears to have been overlooked. The publication, however, of Mr. David's "Geology of the Vegetable Creek Tin-mining District,"[*] not to speak of the desirability of referring the plant remains to their correct horizons in the series, renders it imperative that some more extended and definite information than "Vegetable Creek" simply, should be added.

With regard to the general geology of the Vegetable Creek District, Mr. David remarks, "During the greater part of that vast period of time[†] the surface of the land was being slowly broken up, and worn down by the action of rain, frost, sunshine, vegetation, and perhaps marine erosion, until a land surface was evolved, which in its broad features resembled the present. Vast thicknesses of sedimentary material having been removed by these means, the underlying crystalline rocks were laid bare, and, erosion proceeding still further, the crystalline rocks themselves and their metalliferous veins became disintegrated, and their materials transported and redistributed by water. . . . . . The intensely worn surfaces of the pebbles in this gravel, and the fact that only the hardest and most indestructible minerals, as quartz, tin-stone, and gem-stones, &c., have survived in them, shows that they must have been subjected to a long process of battering and bruising. . . . . The only power in Nature capable of doing such a work is the sea, where it breaks on a rocky coast. These Tertiary gravels are, therefore, probably of marine origin. . . . . As the land continued to rise, the sea would recede further west; and the rivers being increased in size and power, subaërial degradation would proceed more rapidly. The channels of the rivers would be continually deepened, and the whole surface of the land gradually lowered to adapt itself to the increasing fall of the rivers. . . . . What was the exact configuration of the country at the time of the first outbreak of the basalt lavas geological evidence fails to tell. That part only which has been sealed up under the lava sheets has been preserved to the present day, and its shape is being gradually restored by the workings on the 'deep leads.' The results of these subterranean explorations tend to show that most of the country now covered by lava sheets, and forming in places main lines of water-parting, was at that time near to, or part of the principal drainage channels, and that the trend or fall of these old rivers agreed approximately with that of their nearest modern equivalents . . . . The flora of the period, to judge from the number and variety of leaves entombed in the Eocene pipeclays, was rich and diversified. The fossils are chiefly leaves of herbs, trees, and ferns, some having fruit, and a blossom delicately preserved. . . . . At a time then when the physical features of the country were somewhat similar to what they are now, and its surface, probably some 20 or so feet higher than at present, was covered with an Eocene flora, volcanic energy revealed itself in the first eruptions of basalt. The hard rocks of the quartz-porphyry, felstone, and granite, were rent open; and, where the volcanic forces became centralised, small cones were thrown up composed of comminuted fragments of the underlying rock and scoriaceous basalt. The lava emanating from these centres poured into the valleys in streams from 100 to 200 feet thick, flowing for a distance of from 6 to 12 miles. Dispossessed of their old beds, the creeks and rivers had to wear for themselves fresh channels, either down the centre of the lava stream, or along one or both of its margins. . . . . That the volcanic activity was prolonged for a vast space of time is proved by the extent of denudation which has taken place between the older flows of lava and the newer. The amount of this can be measured at the upper end of the Vegetable Creek Deep Lead, at Rose Valley. . . . . The section at Griffiths and Fox's shafts shows that a watercourse has cut through one or more flows of basalt, altogether to a depth of about 60 feet. Then succeeded another flow of basalt, which buried the second channel to a depth of 100 feet. . . . . Powerful streams must have flowed in places over the surface of the basalt, long after its consolidation, as evinced by the coarse Pliocene gravel. . . . . This gravel is, roughly, about 150 feet above the Severn River. . . . . These patches of Pliocene river gravel show that at the close of the tertiary volcanic period the outpouring of the lava streams by filling up the valleys had locally raised the level of the drainage channels."[*]

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[*] Geology of the Vegetable Creek Tin-mining Field, New England District, New South Wales, with maps and sections (Department of Mines, Geological Survey of New South Wales), pp. 10 and 169, 4to, Sydney, 1887.

[†] Prætertiary.

By far the largest number of the plants were obtained from the Old Rose Valley Lead, between Hill and Watson's shafts, a tributary of the Main Vegetable Creek Deep Lead. They occur in a white pipeclay, forming the overburden of the stanniferous wash-dirt. This bed is again overlain by a considerable thickness of basalt, a portion of the older flow which has more or less filled the former channel of Vegetable Creek. The species found in this bed are the following:—

Filices	Pteris Torresii, *Ett.*
	Lygodium Strzeleckii, *Ett.*
Cycadeæ	Anomozamites Muelleri, *Ett.*
Coniferæ	Callitris prisca, *Ett.*
	Heterocladiscos thujoides, *Ett.*
Abietineæ	Sequoia australiensis, *Ett.*
	Dammara intermedia, *Ett.*
	„ podozamioides, *Ett.*
	Palæocladus cuneiformis, *Ett.*
	Phyllocladus asplenioides, *Ett.*
Gramineæ	Poacites australis, *Ett.*
	Bambusites arthrostylinus, *Ett.*
Casuarineæ	Casuarina Cookii, *Ett.*
Cupuliferæ	Quercus Greyi, *Ett.*
	„ hapaloneuron, *Ett.*
	„ Blamingii, *Ett.*
	Dryophyllum Howitti, *Ett.*
	Fagus celastrifolia, *Ett.*
	„ Hookeri, *Ett.*
Moreæ	Ficus Burkei, *Ett.*
	„ Gidleyi, *Ett.*
	„ Solanderi, *Ett.*
	„ Phillipsii, *Ett.*
	„ Willsii, *Ett.*
Artocarpeæ	Artocarpidium Gregoryi, *Ett.*

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[*] *Loc. cit.*, pp. 58-62.

Laurineæ …………	Sassafras Lesqucreuxii, *Ett.*
Santalaceæ …………	Santalum Frazeri, *Ett.*
Proteaceæ …………	Persoonia Murrayi, *Ett.*
	Grevillea Wentworthi, *Ett.*
	Rhopala sapindifolia, *Ett.*
	„ Parryi, *Ett.*
	Lomatia Brownii, *Ett.*
	„ castaneæfolia, *Ett.*
	„ Evansii, *Ett.*
	Banksia Lawsoni, *Ett.*
	„ Hovelli, *Ett.*
	„ myricæfolia, *Ett.*
	„ lancifolia, *Ett.*
	„ Blaxlandi, *Ett.*
	„ Campbelli, *Ett.*
	Dryandra præformosa, *Ett.*
	„ Benthami, *Ett.*
Asperifoliæ …………	Trachyphyllum myosotinum, *Ett.*
	„ obtusum, *Ett.*
Araliaceæ …………	Aralia Freelingii, *Ett.*
	„ prisca, *Ett.*
	„ Oxleyi, *Ett.*
Acerineæ ……………	Acer subproductum, *Ett.*
Celastrineæ …………	Celastrus præeuropæus, *Ett.*
	„ præelænus, *Ett.*
	„ Lefroyi, *Ett.*
Rhamneæ …………	Pomaderris Banksii, *Ett.*
Combretaceæ ………	Gctonites Wilkinsoni, *Ett.*
Myrtaceæ …………	Callistemophyllum Beckeri, *Ett.*
	„ obliquum, *Ett.*
	Myrtonium obtusifolium, *Ett.*
	„ lanccolatum, *Ett.*
Papilionaceæ ………	Dalbergophyllum affine, *Ett.*
Cæsalpineæ …………	Cassia castanospermoides, *Ett.*
	Podogonium macrocarpum, *Ett.*

Very different is the lithological character of the fossiliferous deposit at Witherden's Tunnel (portion 50, Parish of Hamilton), at the Two-mile, near

Emmaville. Here it consists of a dark brown, fine, sandy, carbonaceous clay. The shaft in connection with the tunnel passed through the older basalt into the stanniferous wash, but was never bottomed. The fact, however, of passing through this flow leaves little doubt that the plant bed occupies a similar stratigraphical horizon to the pipeclay at Hill and Watson's. The following plants characterise this stratum :—

Abietineæ …………	Pseudopinus Wilkinsoni, *Ett.*
Taxineæ ……………	Podocarpus præcupressina, *Ett.*
	Dacrydium cupressinoides, *Ett.*
Myriceæ ……………	Myrica pseudosalix, *Ett.*
Cupuliferæ …………	Quercus Austini, *Ett.*
	„ Hartogi, *Ett.*
	„ Darwinii, *Ett.*
	„ Edelii, *Ett.*
	„ Dampieri, *Ett.*
	Fagus Muelleri, *Ett.*
	„ Benthami, *Ett.*
Ulmaceæ ………………	Ulmophyllum oblongum, *Ett.*
Monimiaceæ ………	Monimea vestita, *Ett.*
Laurineæ …………	Cinnamomum polymorphoides, *McCoy.*
	„ Nuytsii, *Ett.*
	Diemenia speciosa, *Ett.*
Proteaceæ …………	Hakea Duttoni, *Ett.*
Oleaceæ ……………	Olea Macintyrei, *Ett.*
Apocynaceæ ………	Apocynophyllum Kingii, *Ett.*
	„ Mackinlayi, *Ett.*
	„ crassum, *Ett.*
	Apocynocarpum sulcatum, *Ett.*
Sapotaceæ ……… ..	Sapotacites Forresti, *Ett.*
Saxifragaceæ ………	Ceratopetalum Macdonaldii, *Ett.*
	„ Gilesii, *Ett.*
Tiliaceæ ……………	Elæocarpus Muelleri, *Ett.*
Malpighiaceæ ………	Banisterophyllum australiense, *Ett.*
Myrtaceæ …………	Eucalyptus Diemenii, *Ett.*
	„ Houtmanni, *Ett.*
	„ Hayi, *Ett.*
Papilionaceæ ………	Dolichites coriaceus, *Ett.*

Cæsalpineæ	Cassea castanospermoides, *Ett.*
	„ phaseolitoides, *Ett.*
	Copaifera australiensis, *Ett.*
Incertæ Sedis	Sapindostrobus dubius, *Ett.*

The leaves obtained at Fox and Partridge's are from a shallow lead forming a part of the newer series of leads between the Rose Valley and the Red Hill, 2 miles from Emmaville. The matrix is a shaly ironstone, reposing in an old valley on the denuded sides of the older and newer basalt, perhaps even entirely on the former. The depth of sinking varied from 30 to 50 feet, the strata passed through being a mixture of volcanic dust, clay, and sand. The plant remains were accompanied by those of insects, some of the specimens being in a fair state of preservation. The flora of this deposit is as follows :—

Taxineæ	Ginkgocladus australiensis, *Ett.*
Myriceæ	Myrica Koníncki, *Ett.*
Betulaceæ	Alnus Maccoyi, *Ett.*
Monimiaceæ	Hedycarya Wickhami, *Ett.*
Laurineæ...............	Laurus australiensis, *Ett.*
Proteaceæ	Lomatia Finnisii, *Ett.*
	„ Goyderi, *Ett.*
Myrsineæ	Myrsine Stokesii, *Ett.*
Sapindaceæ............	Sapindus Gossei, *Ett.*
Celastrineæ............	Elæodendron subdegener, *Ett.*
Ilicineæ	Ilex Macleayana, *Ett.*
Diosmeæ	Boronia Harrisii, *Ett.*
	„ Hookeri, *Ett.*
Myrtaceæ	Eucalyptus Mitchellii, *Ett.*
	Callistemophyllum Hackii, *Ett.*
	„ Swindeni, *Ett.*

In the outlying district of Wellington Vale, to the north-east of Vegetable Creek, two flows of basalt are known to overlie two corresponding leads.* "Both flows have a meridional trend, and the lava streams probably emanated from the stunted lava cones at the north-east end of the parish of Wellington Vale. The thickness of the upper sheet near this point cannot be less than between 200 and 250 feet, and that of the lower sheet about 100 feet." Amongst the strata struck in Bates' shaft, portion 170, Wellington Vale, was an indurated carbonaceous shale with leaves forming a part of the upper lead. The leaves are referable to a sapindaceous plant:—

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* David, *loc. cit.*, p. 108.

CUPANITES SELWYNI, *Ett.*

A branch of the Rocky Creek Lead known as the Gem Lead, in the Parish of Lorne, has to some extent yielded fossil leaves. The alluvial matter consists of pipeclay, associated with magnesite, and overlying well-worn quartz sand, and small pebbles of quartz-porphyry. In the pipeclay a graminacious plant is found, called by Ettingshausen—

BAMBUSITES ARTHROSTYLINUS, *Ett.*

Professor Ettingshausen includes the whole of the plants under the general term Eocene; but it must be borne in mind that great changes took place between the deposition of the two fossiliferous deposits represented by the pipeclay of the Old Rose Valley Lead and the bed cut in Witherden's Tunnel on the one hand, and that found at the much higher level in Fox and Partridge's workings, between Rose Valley and the Red Hill, on the other. The lowest drifts represented by the former were covered with a considerable thickness of the older dark green dense basalt, and then the flow denuded into deep valleys. A second flow of basalt then took place in what is now the neighbourhood of Fox's shaft, covering up the denuded surface of the older. Both these lava flows were in their turn excavated, and the newer drifts laid down in the valleys thus formed. It will be seen from this that between the times at which the two floras grew, no less than five distinct geological changes took place. These phenomena are excellently shown on Section 2, Vegetable Creek Deep Lead, attached to Mr. David's work previously referred to.

Very little stratigraphical information is to hand respecting the other localities mentioned in the Second Part of this Memoir. At Newstead, near Elsmore, and on the Macintyre River, near Inverell, plant remains, and seeds accompanied by fresh-water shells, occur in a concretionary ironstone, apparently an earthy limonite, overlaid by basalt. The species are the following:—

Apetalæ...............	Piper Feistmanteli, *Ett.*
Myriceæ..............	Myrica Konincki, *Ett.*

Betulaceæ	Alnus Maccoyi, *Ett.*
Cupuliferæ	Quercus Darwini, *Ett.*
	Fagus Benthami, *Ett.*
Artocarpeæ	Artocarpedium Gregorii, *Ett.*
Laurieneæ	Cinnamomum Leichhardtii, *Ett.*
	Diamenia speciosa, *Ett.*
Araliaceæ	Aralia elsmoreana, *Ett.*
Tiliaceæ	Elæocarpus Muelleri, *Ett.*
Acervineæ	Acer subintegrilobum, *Ett.*
	,, subproductum, *Ett.*
Malpighiaceæ	Malpighiastrum Babbagei, *Ett.*
Sapindaceæ...........	Sapindus Gossei, *Ett.*
Insertæ sedis	Carpolithes amaranthaceus, *Ett.*
	,, pygeoides, *Ett.*
	,, morisoniæformis, *Ett.*
	,, wetherellioides, *Ett.*

In the same neighbourhood, at Tingha, leaves are found in a carbonaceous clay in Watson's Starlight Claim, forming part of a deep lead under a basalt sheet. The position of this deposit, as compared with those of Vegetable Creek, has not been determined. The following are the species:—

Abietineæ	Pseudopinus Wilkinsoni, *Ett.*
	,, Sequoia australiensis, *Ett.*
Taxineæ	Dacrydium cupressinoides, *Ett.*
Cupuliferæ	Quercus Konincki, *Ett.*
Apocynaceæ	Apocynophyllum Warburtoni, *Ett.*

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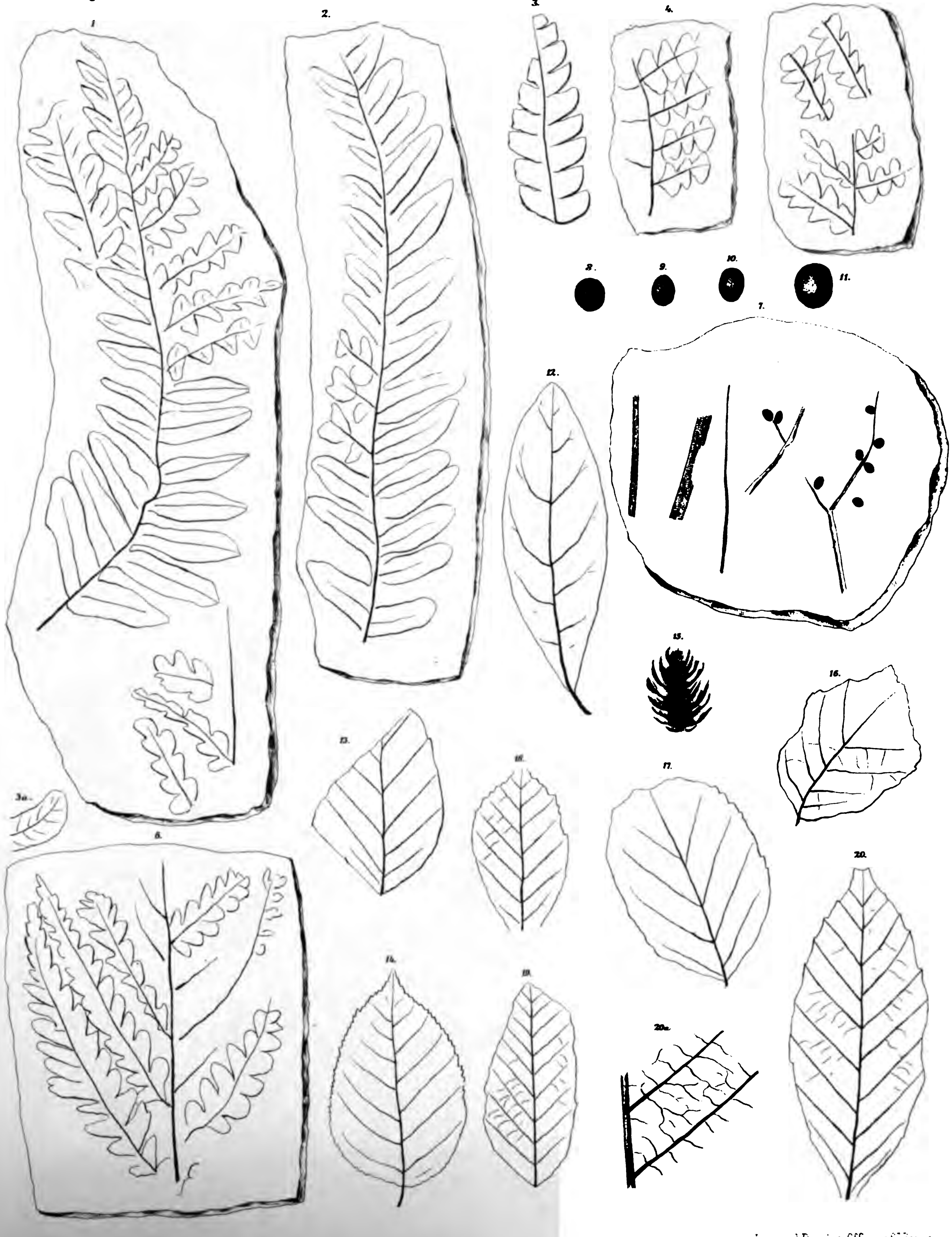

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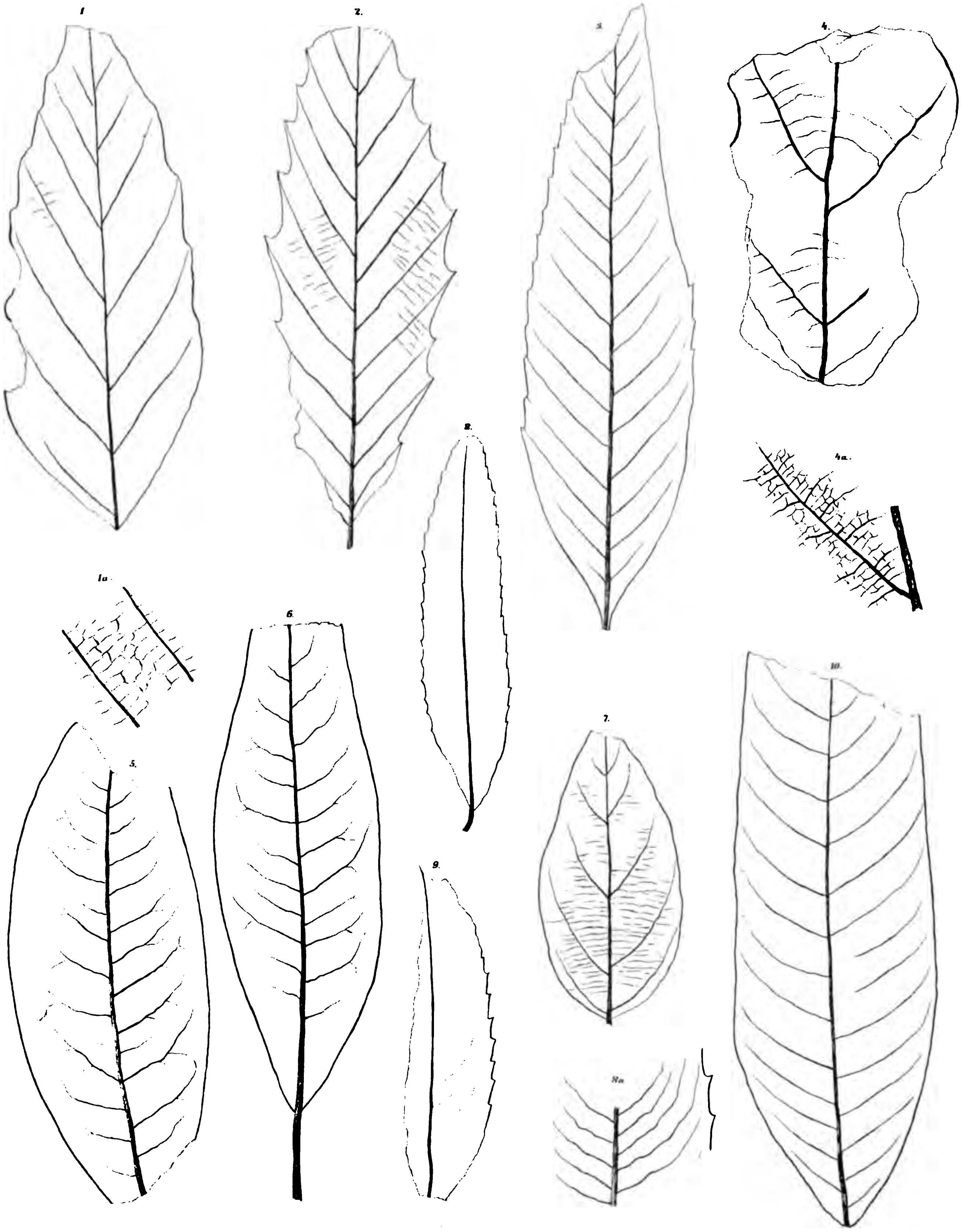

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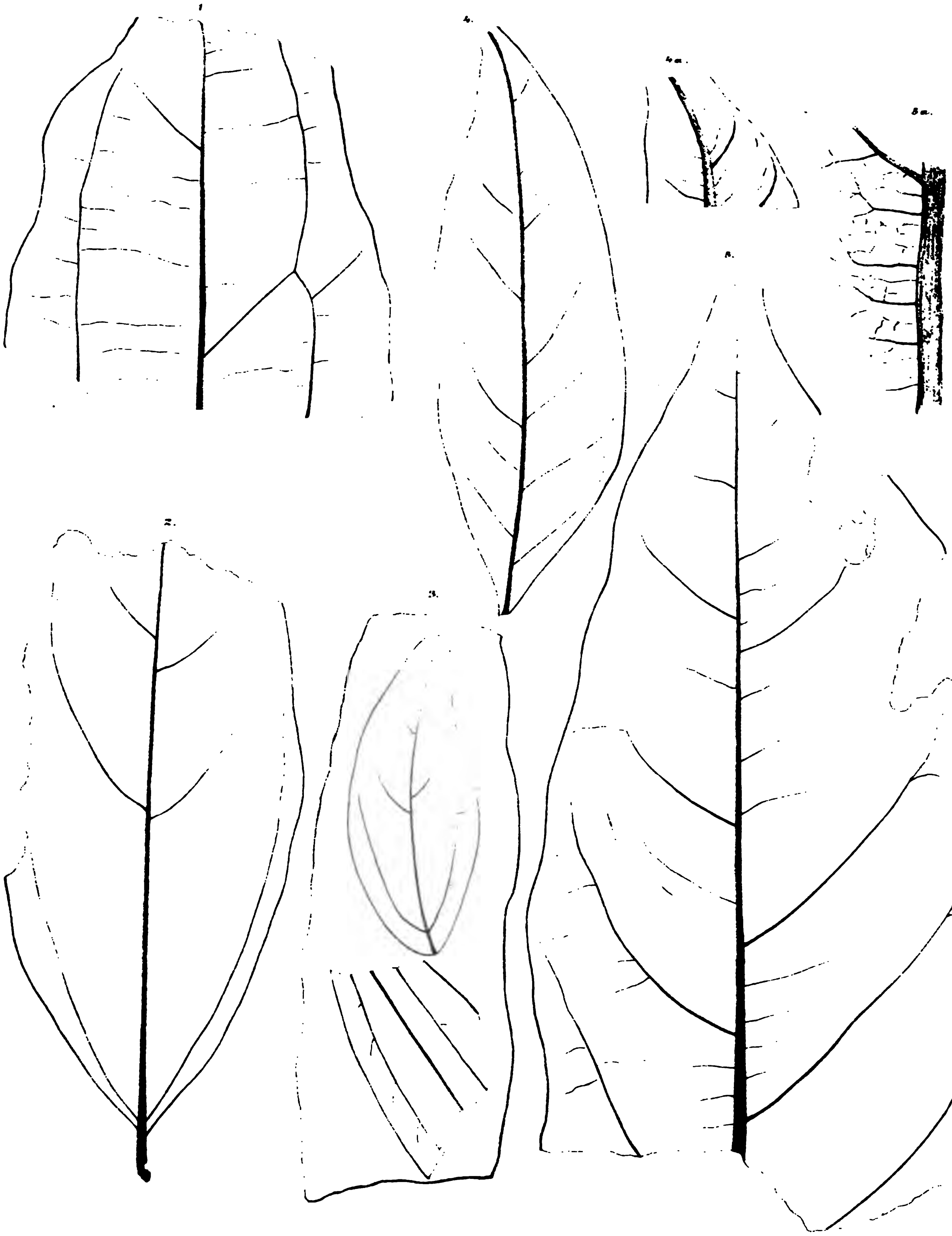

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1 Cinnamomum Leichardtii. 2 C. polymorphoides Mc.Coy. 3 C. Woodwardii. 4 Ficonium Solandri. 5 Artocarpidium Stuartii.

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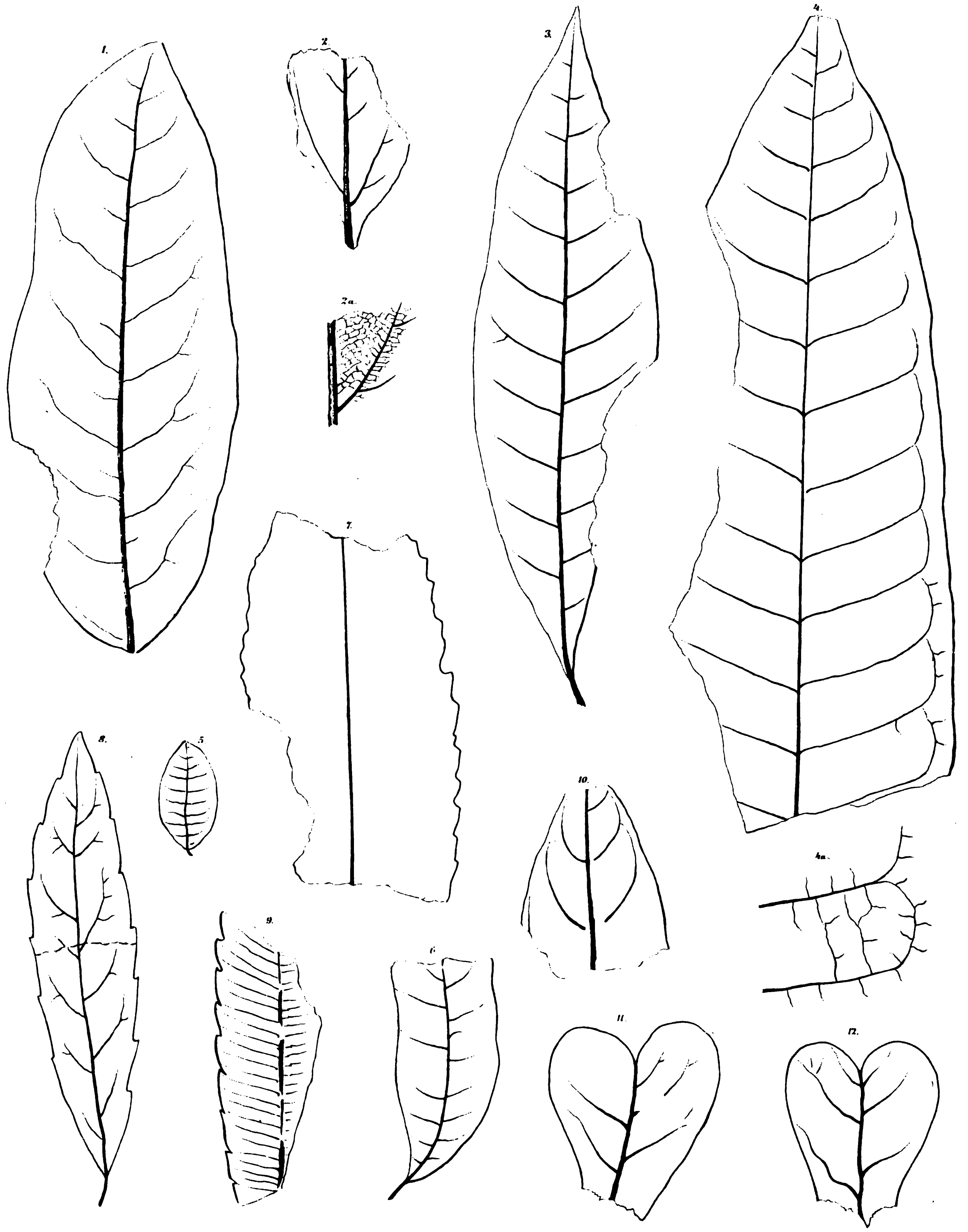

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1 Laurus Australiensis. 2 Cinnamomum Hobartianum. 3 Tabernaemontana primigenia. 4 Apocynophyllum Etheridgei 5 A. microphyllum. 6 A. travertinum. 7 Knightia Daltoniana. 8 Lomatia prae-longifolia. 9 Dryandroides Johnstonii. 10 Echitonium obscurum. 11, 12 Sapotacites oligoneuris.

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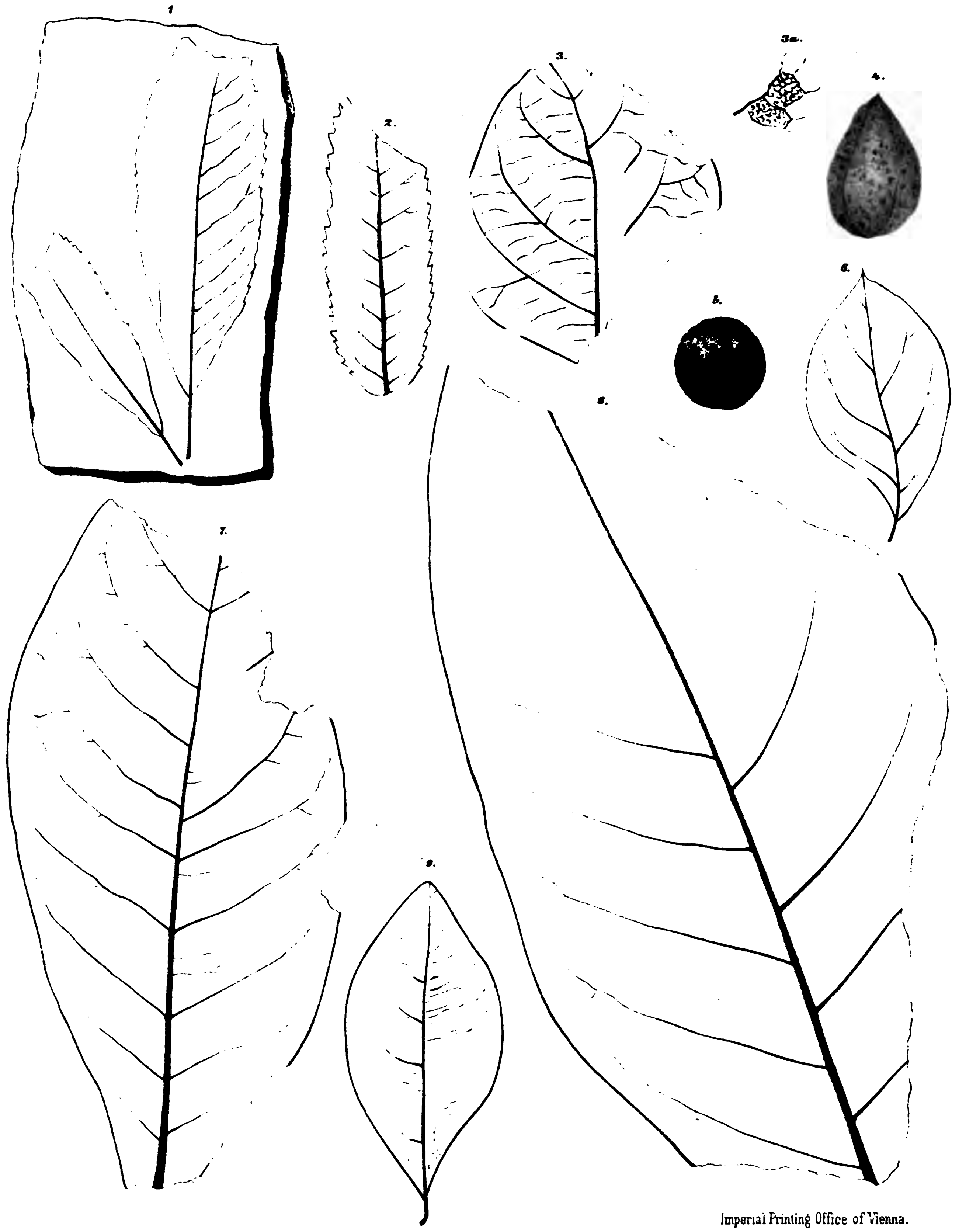

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1 Ceratopetalum Woodii. 2 C. prae-arbutifolium. 3-5 Cordia Tasmanica. 6 Coprosma prae-cuspidifolia.
7 Magnolia Brownii. 8 M. Torresii. 9 Sapotacites achrasoides.

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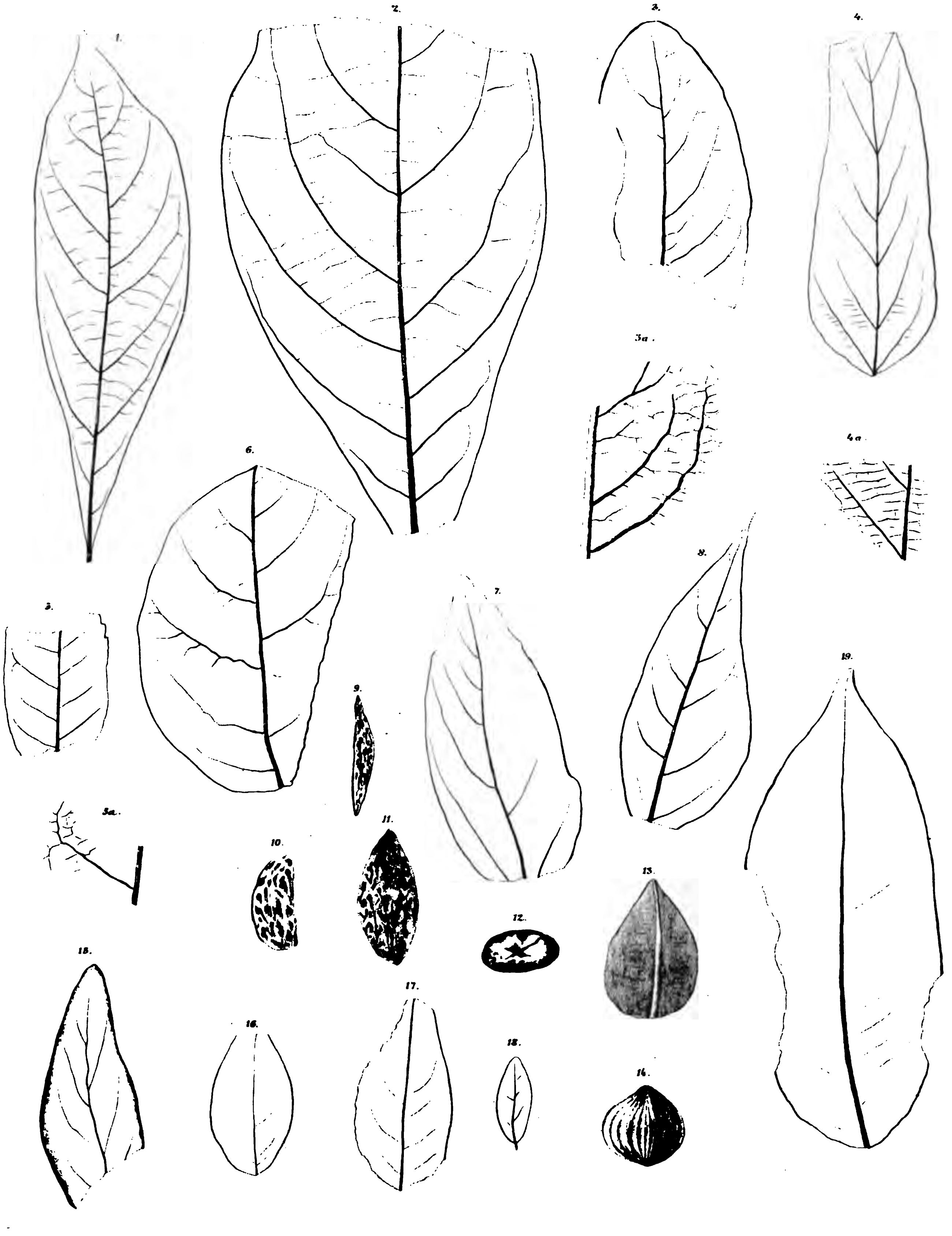

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1 Bombax Sturtii. 2 B. Mitchellii. 3 Pittosporum priscum. 4 Pomaderrites Banksii. 5 Celastrophyllum Cunninghami. 6 Premna Drummondii. 7 Phyllites populiformis. 8 Sapindus Tasmanicus. 9-12 Elaeocarpus Bassii. 13 Carpolithes gaertnerioides. 14 C. Risdonianus. 15 Eucalyptus Delftii. 16 Dalbergia Diemenii. 17 Leguminosites Kennedyi. 18 Cassia Flindersii. 19 C. Cookii.

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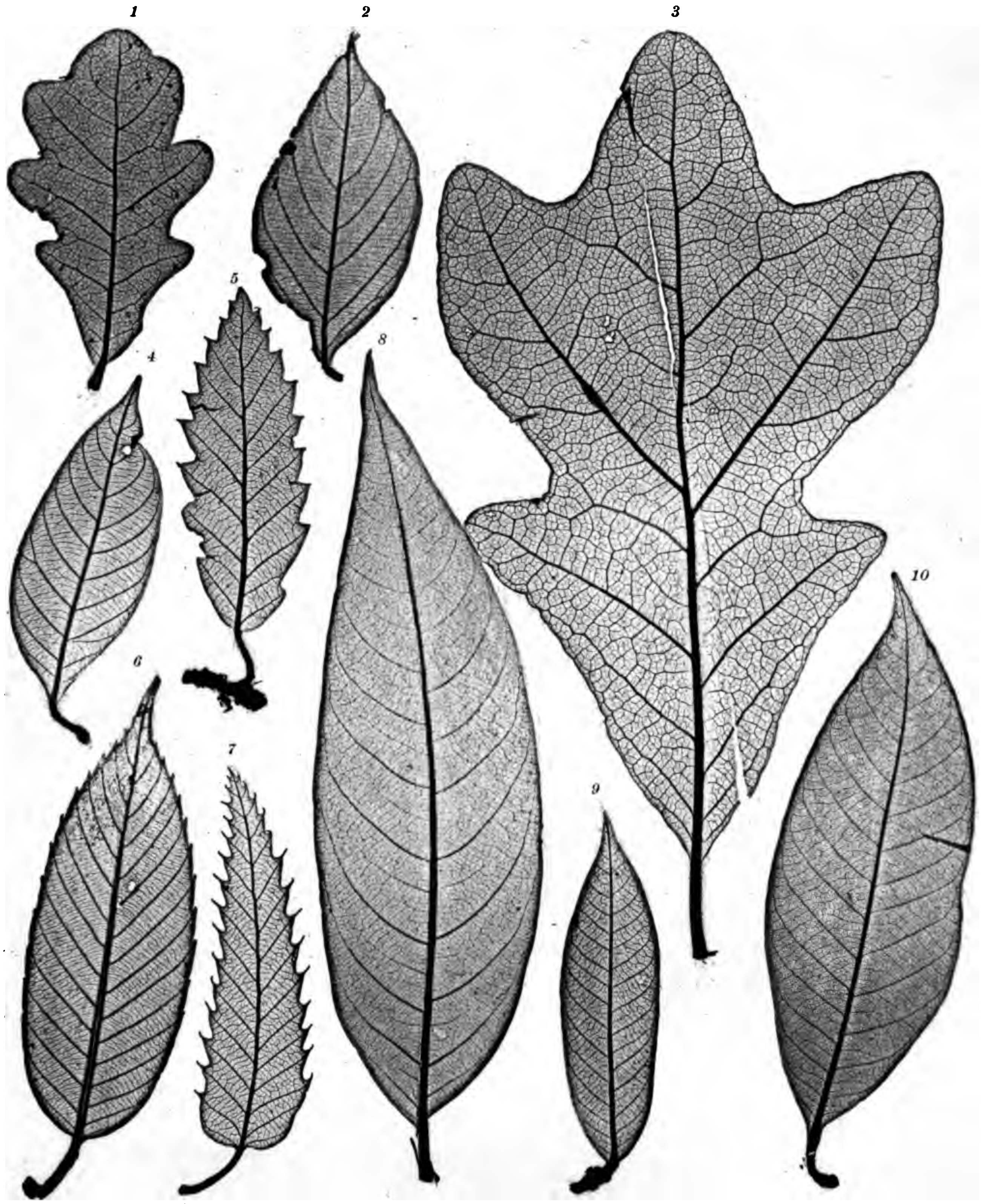

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1, 3 *Quercus stellata.* **2** *Q. Philippinensis.* **4** *Q. fenestrata.* **5** *Q. castaneaefolia.* **6** *Q. oxyodon.* **7** *Q. Libani.* **8** *Castanopsis argentea, Var. Martabanica.* **9** *C. concinna.* **10** *Quercus Amherstiana.*

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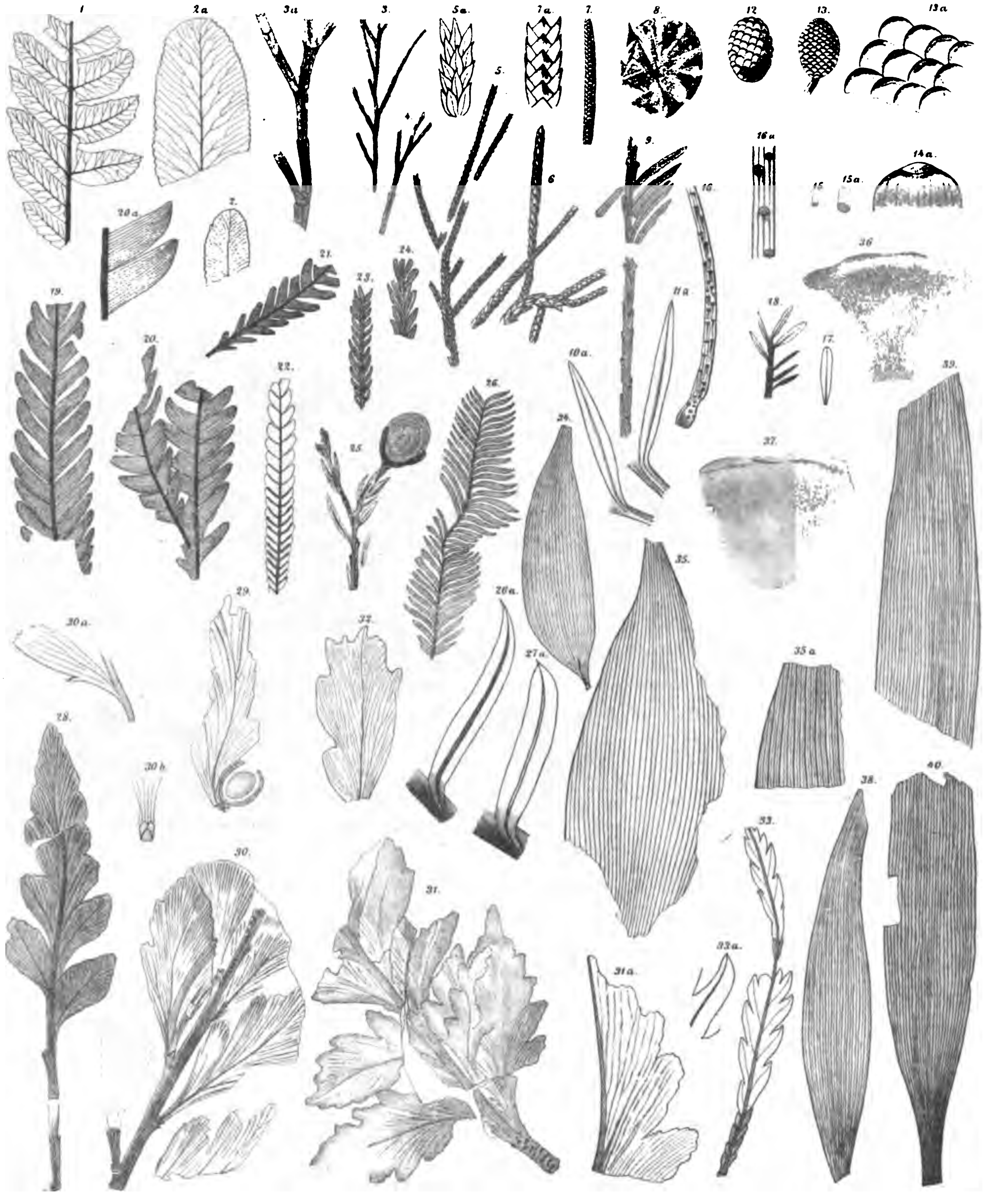

1 Pteris Torresii. 2 Lygodium Strzelecki 3,4 Callitris prisca. 5-7 Heterocladiscos thujoides 8-11 Sequoia Australiensis. 12-18 Pseudopinus Wilkinsoni. 19-22 Anomozamites Muelleri. 23, 24 Dacrydium cupressinoides. 25-27 Podocarpus prae-cupressina. 28-31 Phyllocladus asplenioides 32 Ginkgocladus Australiensis. 33 Palaeocladus cuneiformis. 34-38 Dammara intermedia. 39,40 D. podozamioides.

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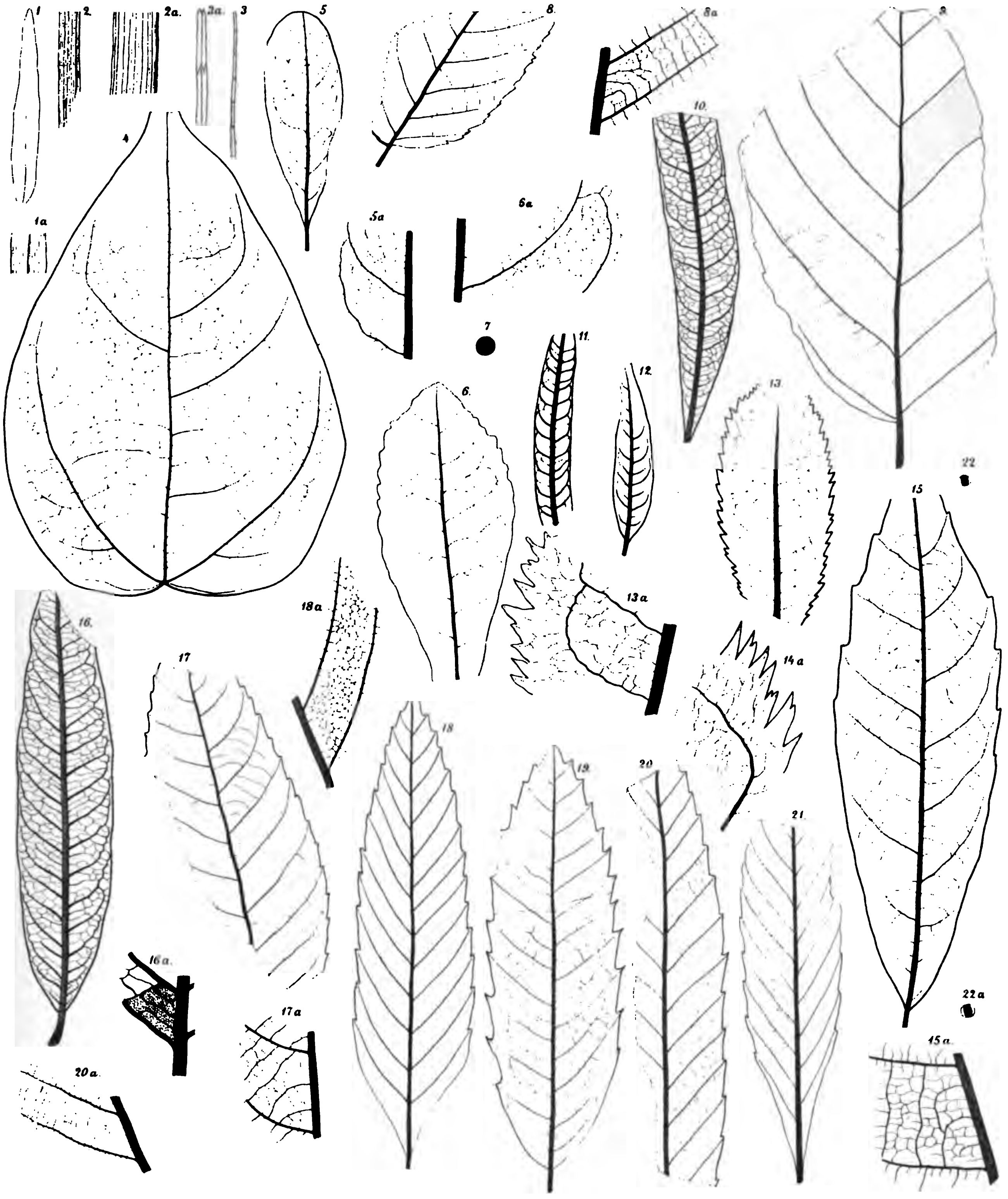

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1 Bambusites arthrostylinus. 2 Poacites australis. 3 Casuarina Cookii. 4 Piper Feistmantelii. 5 Myrica Pseudo-Salix. 6-7 M. Koninki. 8, 9, 22 Alnus Mac Coyi. 10 Quercus. Greyi. 11, 12 Q. Austini. 13 Q. Edelii. 14 Q. serra. 15 Q. Dampieri. 16 Q. Wilkinsoni. 17 Q. Blamingii. 18 Q. Darwinii. 19 Q. Hartogi. 20, 21 Q. hapaloneuron.

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